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COLE (J. S.). **Studies in the physiology of parasitism. XX. The pathogenicity of Botrytis cinerea, Sclerotinia fructigena, and Sclerotinia laxa, with special reference to the part played by pectolytic enzymes.**—*Ann. Bot., Lond.*, N.S., 20, 77, pp. 15–38, 1 fig., 5 graphs, 1956.

In a further contribution to this series from the Imperial College of Science and Technology, London [cf. *R.A.M.*, 34, p. 667 and next abstract], it is reported that little or no pectolytic activity was detectable in extracts of apple tissue rotted by *Botrytis cinerea*, *Sclerotinia fructigena*, or *S. laxa*. A more marked loss of pectic materials in the tissue was noted following invasion by *B. cinerea* and *S. laxa* than by *S. fructigena*. In synthetic media all three fungi produced pectolytic enzymes, the activity of *S. fructigena* being stimulated by the replacement of glucose by pectin. The presence of apple extracts in the medium inhibited pectolytic activity in all three fungi. Certain of the pectolytic enzymes, particularly those of *B. cinerea*, were deactivated by oxidized apple juice, indicating an interaction between the pectolytic and oxidizing systems.

SINGH (R. K.) & WOOD (R. K. S.). **Studies in the physiology of parasitism. XXI. The production and properties of pectic enzymes secreted by Fusarium moniliforme Sheldon.**—*Ann. Bot., Lond.*, N.S., 20, 77, pp. 89–103, 1956.

The addition of apple extract to an otherwise suitable medium, i.e., one containing natural extracts, pectic substances, or galacturonic acid, inhibited the production of macerating enzymes [see preceding and next abstracts] by *Fusarium moniliforme* [*Gibberella fujikuroi*] isolated from sugar-cane. Protopectinase activity was highest at pH 8 to 9; it was lost above 50° to 60° C., and reduced in the presence of more than 0·02 M phosphate. An enzyme similar to protopectinase was also produced, which reduced the viscosity of pectic solutions.

G. fugikuroi secreted protopectinase in potato extract but did not readily parasitize potato tubers, while the reverse was observed with *F. avenaceum*.

GUPTA (S. C.). **Studies in the physiology of parasitism. XXII. The production of pectolytic enzymes by Pythium de Baryanum Hesse.**—*Ann. Bot., Lond.*, N.S., 20, 77, pp. 179–190, 1 fig., 4 graphs, 1956.

The pectolytic activity [see preceding abstracts] of *Pythium debaryanum* was stimulated by the presence of chlorine ions and inhibited by calcium in a synthetic medium. Enzyme production was equally good in media containing glucose, fructose, and mannose, but was poor with sucrose unless a little of it was replaced by glucose. Optimum production was achieved by autoclaving the glucose, fructose, or mannose in an alkaline medium, or by adding a small quantity of glucose which had been dry heated at 150° C. for 20 minutes. The stimulatory substance thus produced was probably glyceraldehyde.

Apparao [? Appa Rao] (A.), Saraswathi-Devi (Miss L.), & Suryanarayanan (S.). **Growth requirements of Piricularia oryzae Br. et Cav.**—*J. Indian bot. Soc.*, 34, 1, pp. 37–42, 1955.

A study at the University Botany Laboratory, Madras, on an isolate of *Piricularia oryzae* [from rice: *R.A.M.*, 33, p. 625; 34, p. 667], mainly thiamine-heterotrophic on a sucrose nitrate medium [cf. 33, p. 177 and next abstract], indicated that thiamine, iron, zinc, and possibly copper were indispensable for growth, but independent in their action.

Appa Rao (A.), Subba Rao (N. S.), & Suryanarayanan (S.). **Influence of the culture filtrate of Fusarium vasinfectum Atk. on Piricularia oryzae Br. et Cav.**—*Curr. Sci.*, 24, 4, p. 125, 1955.

In further studies at the University Botany Laboratory, Madras, a dialysed and autoclaved culture filtrate from the strain of *Fusarium vasinfectum* used in previous experiments [*R.A.M.*, 32, p. 481; cf. next abstract] was added to 50 ml. of Richards's solution (pH 6) and inoculated with *Piricularia oryzae* which is known to be heterotrophic for thiamine [see preceding abstract] and to possess a complementary deficiency for biotin. After three weeks' incubation at 27° to 28° C. growth had increased to 130 mg. (mat weight) but was less than that in Richards's solution with added thiamine (263 mg.). It is suggested that the culture filtrate of *F. vasinfectum* may have a thiamine replacement value.

Kalyanasundaram (R.). **Bioassay of Fusarium toxin—agar cup method for quantitative evaluation.**—*J. Indian bot. Soc.*, 24, 1, pp. 43–46, 1 graph, 1955.

At the University Botany Laboratory, Madras, 100 isolates of bacteria from soil were tested against 21-day-old culture filtrate of *Fusarium vasinfectum* [see preceding and following abstracts]; 19 were markedly inhibited. The most sensitive (No. 5) was selected for perfecting an assay method for determining the concentration of the antibiotic (fusarinic acid).

Kalyanasundaram (R.). **Soil conditions and root diseases. XIV. Host-parasite response to Fusarium wilt.**—*Proc. Indian Acad. Sci.*, Sect. B, 42, 4, pp. 145–153, 1 pl., 1955.

In a further contribution to this series [cf. *R.A.M.*, 34, p .226] the author describes investigations at the University of Madras on the toxins derived from *Fusarium vasinfectum*. The symptoms that appear in susceptible cotton [loc. cit.] are due to fusaric [? fusarinic] acid [32, p. 269]; these do not appear in resistant cotton, although the fungus enters the roots. The toxins of *F. vasinfectum* can also damage cut shoots of pigeon pea, even though the fungus cannot infect this plant. There is therefore specificity of infected host, but not of toxin action.

It is indicated that resistance is due to a higher reserve of carbohydrates and ascorbic acid compared to that in susceptible varieties, and it is suggested that these substances are utilized in the resistant plants to form a labile toxic substance which inhibits the pathogen in the vascular system [cf. 35, p. 51].

Kalyanasundaram (R.). **Antibiotic production by Fusarium vasinfectum Atk. in soil.**—*Curr. Sci.*, 24, 9, pp. 310–311, 1955.

In studies at the University Botany Laboratory, Madras, *Fusarium vasinfectum* [*R.A.M.*, 34, p. 537] produced fusaric [? fusarinic] acid [cf. 34, p. 169 and preceding and following abstracts] in soil amended with chopped green *Glyricidia maculata* leaves or oats and then sterilized. The fungus required ample amounts of both organic nitrogen and carbohydrate for the production of the acid in soil.

Lakshminarayanan (K.) & Subramanian (D.). **Is fusaric acid a vivotoxin?**—*Nature, Lond.*, 176, 4484, pp. 697–698, 1955.

In further work at the University Botany Laboratory, Madras, fusaric [? fusarinic]

acid [see preceding abstracts] gave a diffuse, ill-defined, yellow band in a blue background when detected with brom-cresol green [*R.A.M.*, 34, p. 169], possibly owing to poor ionization. The difficulty was overcome by first converting the acid into its copper complex on the filter paper with copper sulphate and irrigating it with excess copper plus *n*-butanol-acetic acid in water in the ratio 4:1:5. This technique was employed for detecting the acid in wilted cotton plants infected by *Fusarium vasinfectum*. Karunganni 2 cotton plants susceptible to the fungus were grown in pots containing 500 gm. sterilized garden soil mixed with 10 per cent. soil-oat inoculum. Wilt appeared after ten days. The typical bands of the copper-fusaric [? fusarinic] acid complex were demonstrated in chromatograms of sap from diseased roots, shoots, and leaves, but not in those of sap from healthy cotton plants grown under similar conditions.

SUBRAMANIAN (C. V.). **Vivotoxins and fusariose wilts in plants.**—*Curr. Sci.*, 24, 5, pp. 144–147, 1955.

The physiological basis of vascular wilt diseases of plants infected by various species of *Fusarium* and toxin production *in vivo* within such plants [see preceding and following abstracts] are discussed with reference to the literature (16 titles).

LAKSHMINARAYANAN (K.). **Mechanism of Fusarium wilts of plants.**—*Proc. Indian Acad. Sci.*, Sect. B, 38, 4, pp. 161–164, 1953.

The author collates the results of recent researches on the mechanism of *Fusarium* wilts in plants [see preceding abstracts], indicating that there are two schools of thought as to the cause of wilt, one holding it to be due to the plugging of the vessels [*R.A.M.*, 33, p. 122], the other to toxin production [33, p. 453]: he, himself, considering it to be attributable to a combination of both factors.

DILLINGHAM (E. O.). **Cellulolytic activity and growth characteristics of Pythium irregulare.**—*Diss. Abstr.*, 15, 5, pp. 678–679, 1955.

In studies at Purdue University, the survival of *Pythium irregulare*, isolated from soil [cf. *R.A.M.*, 34, p. 522], was determined in sterile muck and clay soils. It colonized muck soil more readily and for a longer period than clay. It did not withstand severe desiccation, but under moderate conditions in both types of soil it was still viable in soil-water cultures 30 days after viable vegetative mycelium had ceased to be detected. The fungus was unable to attack lignin, but utilized degradation products associated with [unspecified] brown rot. The evidence showed that it was able to utilize cellulose xanthate in the presence or absence of plasticizing materials, the rate of attack depending on the levels of glucose, pH, and nitrogen source.

The factors influencing the degradation of sized and unsized 8 oz. cotton duck by the fungus resembled those affecting the degradation of cellophane, but the rate of fabric decay was much lower. A cell-free extract of the fungus attacked cellulose xanthate and hydrocelluloses prepared from cotton duck. The respiration data obtained when *P. irregulare* was grown on various cellulosic substrates supported the conclusion that it was able to utilize cellulose as a sole source of carbon, but attacked high-grade cellulose (i.e., Whatman's No. 1 filter-paper) at a slow rate.

STEWART (W. D.), WACHTEL (W. L.), SHIPMAN (J. J.), & YANKO (J. A.). **Synthesis of rubber by fungi.**—*Science*, 122, 3183, pp. 1271–1272, 1 graph, 1955.

In work at the Research Center, B. F. Goodrich Company, Brecksville, Ohio, rubber, as *cis*-polyisoprene, was isolated and identified from benzene extracts of sporophores of species of *Lactarius* and *Peziza*.

Black (W.). **Trends in Potato breeding in Great Britain.**—*Euphytica*, 4, 3, pp. 223–226, 1955. [Dutch summary.]

The author summarizes briefly the current trends in potato breeding in Great Britain with particular reference to disease resistance [*R.A.M.*, 34, p. 56].

Wenzl (H.). **Welke-Krankheit und Stolbur- Virose der Kartoffel.** [Wilt disease and 'stolbur' virosis of the Potato.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 9, 1, p. 20, 1955.

The author cannot accept Kovanchevsky's assumption (*NachrBl. dtsch. PflSch-Dienst, Berl.*, N.F., 8, pp. 161–166, 1954) that the stolbur [big bud] virus of Solanaceae is the primary cause of the potato wilt attributed in Austria to *Colletotrichum atramentarium*, since convincing evidence has been presented that the disease is directly dependent on weather and soil conditions [*R.A.M.*, 35, p. 225].

Heinze (K.). **Versuche zur Übertragung des Blattrollvirus der Kartoffel in den Überträger (Myzodes persicae Sulz.) mit Injektionsverfahren.** [Experiments in the transference of the Potato leaf roll virus to the vector (*Myzodes persicae* Sulz.) by injection procedures.]—*Phytopath. Z.*, 25, 1, pp. 103–108, 1 fig., 1955.

Samples of the blood of aphids (*Myzodes* [*Myzus*] *persicae*) injected with potato leaf roll virus by various methods, including Storey's [*R.A.M.*, 12, p. 686], at the Institute for Horticultural Virus Research, Berlin-Dahlem, were examined under the electron microscope. They contained threads up to 5 μ in length. Some of the particles were 1·66, others 3·15 μ long, while lengths ranging from 0·337 to 0·716 and one of 1·404 μ were also observed. The thickness of the inclusions was estimated at 0·0175 μ. Rods measuring 0·62, 0·75, 1·4, and 1·67 μ were also found in the expressed sap of infected *Physalis floridana* [34, p. 806] previously centrifuged for an hour at 25,000 revolutions per minute and in a sap mixture from infected plants of the same host, *Datura stramonium*, and potato.

Although the numbers of samples and measurements were insufficient definitely to identify the particles as those of potato leaf roll virus, the similarity of the long ones to those figured by Sprau (*Z. PflBau*, 3, pp. 213–221, 1952) is suggestive.

Rönnebeck (W.). **Zur Frage der Ausbreitung von Blattrollvirus im Kartoffelfeld. (Vorläufige Mitteilung).** [On the question of the spread of leaf roll virus in the Potato field. (Preliminary note).]—*Z. PflKrankh.*, 62, 8–9, pp. 528–533, 2 diags., 1955.

In further experiments in 1954 at the Justus Liebig Institute, Giessen, Germany, effective prevention of the spread of potato leaf roll virus on the semi-resistant Bona variety was secured only by the combination of two methods, early lifting (30th June and 10th July for best results) [*R.A.M.*, 34, p. 389] and spraying with systox at the rate of 1 l. per ha. at 10-day intervals from 20th June to 19th August for the control of *Myzodes* [*Myzus*] *persicae* [33, p. 551]. Roguing was ineffectual and early lifting alone proved inadequate as a prophylactic measure.

Webb (R. E.), Schultz (E. S.), & Akeley (R. V.). **Some variations in symptomatology and transmission of leafroll in Potato.**—*Amer. Potato J.*, 32, 2, pp. 60–66, 1 pl., 1955.

At Presque Isle, Maine, some plants of potato seedling X927–3, which had been exposed to natural infection by the leaf roll virus [cf. *R.A.M.*, 34, p. 390] for 12 years without being affected, developed persistent apical dwarfing and leaf pigmentation, resembling initial infection with 'yellows' virus. The second generation symptom types were shown to be partly induced by the leaf roll virus. All virus isolates from this seedling transmitted by grafting or by *Myzus persicae* produced symptoms in *Physalis floridana* similar to those of the mild strain 1 of leaf roll

virus. Evaluation of the virus source maintained in Katahdin showed the inoculum to contain three strains. Comparison established that the X927–3 isolate and the mild strain 1 caused similar reactions in *P. floridana*; but the X927–3 isolate was less readily transmitted by aphids or grafting, nor did it become systemic as rapidly as the other strains in Katahdin, seedling 41956, and *P. floridana*.

HOYMAN (W. G.). **Preservation of Potato viruses X and Y by freezing.**—Abs. in *Amer. Potato J.*, 32, 10, pp. 390–391, 1955.

Strains of potato virus X in expressed sap of *Nicotiana glutinosa* frozen in 1951, and of X and Y in *N. glutinosa* and X in potato sap frozen in 1954 were still infective when tested on indicator plants in 1955 [at North Dakota Agricultural Experiment Station, Fargo].

TIMIAN (R. G.), PETERSON (C. E.), & HOOKER (W. J.). **Immunity to virus X in Potato : selection of immune plants in the breeding program.**—*Amer. Potato J.*, 32, 11, pp. 411–417, 2 figs., 1 graph, 1955.

A satisfactory method for mass inoculation of potato seedlings to evaluate resistance to virus X [*R.A.M.*, 35, pp. 37–38] was employed by the authors at Iowa Agricultural Experiment Station, Ames, working in cooperation with the United States Department of Agriculture. Suitably virulent isolates from sap of infected *Nicotiana glutinosa*, diluted one in ten with water, were mixed with 12 gm. 400 mesh carborundum per 100 ml. of inoculum and sprayed on the plants when two true leaves were showing, using a spray gun with a pressure of 15 lb. per sq. in. and a plant-to-nozzle distance of approximately 1 cm. Plants remaining symptomless after this treatment were inoculated again by hand, and finally serological tests were used to eliminate symptomless carriers.

ROBINSON (D. B.) & CALLBECK (L. G.). **Stem streak necrosis of Potato in Prince Edward Island.**—*Amer. Potato J.*, 32, 11, pp. 418–423, 1 fig., 1955.

A stem streak necrosis of potatoes [*R.A.M.*, 27, p. 40; 32, p. 210], also known as 'land streak' or 'stem break', which commonly occurs in Prince Edward Island, especially on the varieties Irish Cobbler and Sebago, was investigated by the Canadian Department of Agriculture, Ottawa. Affected plants are stunted, losing their bright green; stalks and petioles become flecked and streaked, and affected parts may become brown and very brittle. The disease occurs only on very acid soils, probably as a result of manganese toxicity. A high level of nitrogen, phosphorus, and potash fertilizers is beneficial, and the antagonistic action of manganese and phosphorus may reduce the uptake of the former. Lime applications markedly reduce the disease, but raising the soil pH above 5 introduces liability to scab [*Actinomyces scabies*]. It is advisable to plant varieties resistant to stem streak, such as Canso, Green Mountain, and McIntyre, with moderate applications of lime.

WOLCOTT (A. R.) & ELLIS (N. K.). **Varietal response to climate and culture as related to internal browning of Potato tubers.**—Abs. in *Amer. Potato J.*, 32, 11, p. 430, 1955.

To investigate internal browning of potato tubers in northern Indiana [cf. *R.A.M.*, 34, p. 746] 20 varieties and seedling lines were planted under differing cultural practices in muck soils. Degrees of internal browning were correlated with such variations in growth and tuberization as are influenced by photo-period and temperature, and developed under conditions of fluctuating growth that caused resorption of stored material from the tubers. The changing appearance of internal browning symptoms during the season suggested that the different types are related in origin but differ in pattern according to the physiological age of the tuber at the time the injury occurs.

Selman (I. W.) & Schimmer (F[reda] C.). **Disease incidence and yield variation in Potatoes grown for five years with organic and inorganic fertilizers.**—*Emp. J. exp. Agric.*, 23, 91–92, pp. 226–233, 5 graphs, 1955.

At Wye College, London University, King Edward potatoes, originally certified, Scottish, virus-free seed, were grown continuously for five seasons (1950–54), using tubers saved from the same plot in the previous year. The chief fungal damage to freshly harvested tubers was that due to blight (*Phytophthora infestans*) [*R.A.M.*, 34, p. 669] and black scurf (*Corticium solani*) [34, p. 539]. In 1950 the incidence of *P. infestans* was significantly less in tubers grown with compost than with inorganic fertilizers or half and half, but subsequently there were no significant differences in incidence under the various treatments. After four years almost all the plants displayed symptoms of potato virus Y or leaf roll [35, p. 117], despite roguing, and there were no significant differences in virus incidence between the various plots. Yields were reduced by about half in the last year though they were lowest in 1952, a dry year.

Poos (J. A. J.). **The autumn-raising of Potato-seedlings in the open.**—*Euphytica*, 4, 3, pp. 211–214, 1955. [Dutch summary.]

Work at the Plant Breeding Station, Veghel, Holland, demonstrated that raising potato seedlings in the autumn when natural infection by *Phytophthora* [*infestans*] is very heavy [*R.A.M.*, 34, p. 744] permits selection for resistance. Furthermore, as few aphids are then about, virus-free progeny may be expected.

Chambers (S. C.). **Testing Potato seedlings for resistance to Irish blight.**—*J. Dep. Agric. Vict.*, 53, 11, pp. 527–528, 1 fig., 1955.

Following the evaluation of haulm resistance of available potato varieties and hybrids to *Phytophthora infestans* in Victoria [*R.A.M.*, 34, p. 173], Kennebec and 76–15 were selected as parents for the breeding programme. Seedling progeny about 2 in. high were inoculated individually with a suspension containing 10,000 spores per ml. of what was believed to be strain 0 of *P. infestans* [33, p. 251]. The pathogen, applied to the seedling haulms, was incubated for six days at a constant relative humidity of 100 per cent. and a temperature of 60° to 75° F. There were many resistant seedlings among the progenies of the V27 (resistant 76–15 × susceptible 11–79 selections) crossed with common varieties. The resistance of the survivors of V27 to the strain of *P. infestans* occurring in Victoria was confirmed in a blight attack in 1953 at the Potato Research Station, Toolangi.

Doling (D. A.). **Distribution of physiological races of Phytophthora infestans (Mont.) de Bary in Northern Ireland.**—*Nature, Lond.*, 177, 4501, p. 230, 1956.

During 1954 potato foliage affected by *Phytophthora infestans* was collected from all parts of Northern Ireland and examined at Queen's University, Belfast, to determine the most common races present. Seventeen commercial varieties (all *Solanum tuberosum* derivatives) yielded 73 isolates, of which 70 were identified as race 4 and the remaining three, occurring on Arran Victory, Ulster Supreme, and British Queen, as race 0. Of a further 19 isolates obtained from a collection of *S. tuberosum* × *S. demissum* hybrids, six were not identified and the rest belonged to races 1; 2; 4; 1,2; 1,4; and 1,2,4 [cf. *R.A.M.*, 34, p. 808].

Magdon (E.). **Über die Kultur der Phytophthora infestans (Mont.) de Bary auf künstlichem Nährboden und über Antibionten des Pilzes.** [On the culture of *Phytophthora infestans* (Mont.) de Bary on an artificial medium and on antagonists of the fungus.]—*Zbl. Bakt.*, Abt. 2, 108, 23–25, pp. 703–716, 6 figs., 1955.

In continuation of Feustel-Schönbrunn's studies at the Institute for General Botany, Friedrich Schiller University, Jena, Germany [*R.A.M.*, 35, p. 220], the

successful transference of *Phytophthora infestans* from potato tubers to artificial media was found to be dependent on certain conditions. The best results were obtained when isolated sporangia (instead of mycelium) from cut tuber surfaces were inoculated on a freshly poured agar plate and allowed to develop in the incubator at a relative humidity of 98 per cent. and a temperature of 22° C. The most favourable medium, both for the pathogen and for the 73 soil actinomycetes [cf. 34, p. 321] and 30 bacteria tested for potential antagonistic effects, consisted of 33 ml. expressed root sap, 2·5 gm. agar, 0·5 gm. dextrose, 0·25 gm. malt, and 66 ml. distilled water.

Nine strains of actinomycetes exerted a strongly, 14 a moderately, and 26 a weakly antibiotic influence on *P. infestans*. Among the bacteria five isolates were highly antagonistic and eight slightly so. The adverse effects of the soil organisms appeared to be confined to the hyphae and did not perceptibly impair conidial germinability.

Hooker (W. J.). **Survival of Streptomyces scabies in peat soil planted with various crops.**—Abs. in *Amer. Potato J.*, 32, 10, pp. 389–390, 1955.

In experiments [in Iowa] the survival of *Streptomyces* [*Actinomyces*] *scabies* in heavily infested peat soil in bins was determined over a six-year period, following a potato crop, by yearly plate counts of actinomycetes and by growing Cobbler potatoes on soil samples from the bins. Plate counts were highest in soil cropped continuously with maize, almost as high with potatoes, lower with onions and soybeans [cf. *R.A.M.*, 33, p. 623], and much reduced in the fallow plots. With all the crops other than potatoes there was a marked reduction in the survival of *A. scabies*, as indicated by scab on Cobbler in the third year.

Rieman (G. H.) & Young (D. A.). **Antigo : a new white, medium-maturing Potato variety resistant to common scab.**—*Amer. Potato J.*, 32, 11, pp. 407–410, 1955.

At the University of Wisconsin a new variety of potato, Antigo, has been released. It is resistant to scab [*Actinomyces scabies*: *R.A.M.*, 35, p. 223], which is very serious in parts of Wisconsin, is medium-maturing, of average yielding ability, and suited to the muck soils in the State.

Bazán de Segura (Consuelo) & Quevedo Díaz (A.). **The Andean disease of Potato tubers in the Peruvian coast area.**—*Plant Dis. Reptr*, 39, 6, p. 477, 1 fig., 1955. [Multilithed.]

Thecaphora solani, responsible for the 'buba' disease of potato tubers (*Solanum tuberosum* ssp. *andigenum*) [*S. andigenum*] in Venezuela, Ecuador, and Peru [*R.A.M.*, 24, p. 70] and believed to be limited to the Andes at altitudes of 2,500 to 3,000 m., was found in 1954 on *S. stoloniferum* in the lath-house of the Genetics Department of the Agricultural Experiment Station, La Molina, Peru, at 251 m.

Rankin (H. W.). **The influence of Sweet Potato size on the development of internal cork symptoms in the roots.**—*Plant Dis. Reptr*, 39, 6, pp. 455–456, 1955. [Multilithed.]

From 1949 to 1952, inclusive, experiments were carried out at Georgia Coastal Plain Experiment Station, Tifton, to determine the effect of tuber size on the development of sweet potato internal cork virus lesions [*R.A.M.*, 34, p. 747]. A higher percentage of infection and more severe symptoms occurred in large roots than in small. When comparing varieties for resistance, material should be cured and stored under standard conditions and graded to a uniform size.

Young (H. E.). **Director's Report for 1954.**—*Rep. Rubb. Res. Bd Ceylon, 1954*, pp. 4–12, 1955.

A trial of the control of *Oidium* [*heveae*: *R.A.M.*, 34, p. 543] on rubber by spraying

from the air, carried out in Ceylon over an area of 2,000 acres, gave poor control at very great expense. Dusting from the ground proved quite satisfactory and much cheaper. Dusting should be completed by 8.30 a.m.

The heavier foliage carried by the trees as a result of the successful control of *O. heveae* has increased the prevalence of leaf fall due to *Phytophthora palmivora* [loc. cit.] during wet periods later in the year. The outbreaks are, however, generally confined to localized areas.

The incidence of white root disease (*Leptoporus* [*Fomes*] *lignosus*) [loc. cit.; 34, p. 61] was greatly reduced by uprooting old rubber, examining the stumps for the presence of the parasite, and applying sanitary measures to infected areas [see next abstract].

De Silva (C. A.). **Report of the Mycological Department for the year 1954.**—*Rep. Rubb. Res. Bd Ceylon, 1954*, pp. 69–83, 1955.

In this report [cf. *R.A.M.*, 34, p. 543] it is stated that in further breeding against rubber powdery mildew (*Oidium heveae*) in Ceylon [see preceding abstract] much preliminary work has been done in crossing the resistant clone LCB. 870 [35, p. 230] with the better-known high-yielding clones. The Institute is to import South American clones resistant to *Dothidella ulei*, and these will be tested against *O. heveae*. Clones which have already reached Ceylon from Malaya include FX.25.

Several attempts have been made by manufacturers to improve the efficiency of fungicidal dusting by the use of stickers, so far without result.

Since 1948 the attention of planters has been drawn to the fact that old seedling rubber can carry *Leptoporus* [*Fomes*] *lignosus* [see preceding abstract] in the root system with no sign of the disease above the ground.

The information in an Appendix to this report by J. H. Van Emden (pp. 75–83) on the incidence and control of *O. heveae* in Ceylon has already been noticed [loc. cit.].

Young (H. E.). **Brown root disease of Hevea caused by Fomes lamaensis (Murr.) Sacc. ex Trott.**—*Adv. Circ. Rubb. Res. Inst. Ceylon* 48, 2 pp., 1954.

A short account is given in popular terms of brown root rot of *Hevea* rubber trees in Ceylon, caused by *Fomes lamaensis* [*R.A.M.*, 7, p. 669], as distinct from that caused by *F. noxius* [cf. 12, p. 55; 34, p. 545] under the headings: recognition of the disease; the fruiting body; appearance of diseased plants; spread; and control. As the fungus makes comparatively slow progress through the soil trenches are unnecessary. The diseased tree should, however, be eradicated and all roots removed and burned, with the stumps, *in situ*.

Bolle-Jones (E. W.). **Nutrition of Hevea brasiliensis. II. Effect of nutrient deficiencies on growth, chlorophyll, rubber and mineral contents of Tjirandji 1 seedlings.**—*J. Rubb. Res. Inst. Malaya*, 14, *Commun.* 290, pp. 209–230, 14 figs., 1954.

In further investigations at the Rubber Research Institute, Malaya [cf. *R.A.M.*, 34, p. 814], seedlings of *Hevea brasiliensis*, clone Tjirandji 1, were grown in pot sand cultures in which nitrogen, sulphur, phosphorus, magnesium, potassium, calcium, iron, manganese, and boron were separately either omitted or supplied in limited amounts. Each such treatment was found to retard or limit growth, and except in the case of calcium and boron deficiency, typical, diagnostic, visual symptoms became apparent, which are described in detail.

The rubber concentration found in stems and petioles was reduced as a result of mineral deficiencies during the early part of the experiment, but subsequently became proportionately greater as the effects of the treatments on dry weight yield became pronounced.

It was shown that the requirements of *H. brasiliensis* for calcium and boron were low, and that the latter accumulated considerably in the lamina. Deficiencies of potassium or manganese increased the phosphorus content of the lamina, while those of nitrogen, sulphur, or phosphorus decreased its magnesium content, which was in turn increased by potassium and calcium deficiencies. Restricted supplies of nitrogen, magnesium, or calcium increased the potassium content, while deficiencies of magnesium or potassium increased that of calcium. Potassium-deficient laminae contained a lower iron content than those with the complete nutrient. Evidence for an interrelationship between the nitrogen and manganese in the plant was adduced.

Symposium on soil micro-organisms and plant well-being. Twentieth annual meeting of the Indian Academy of Sciences, Belgaum, December, 1954. *Proc. Indian Acad. Sci.*, Sect. B, 41, 3, pp. 97–154, 1955.

In opening this symposium, concerned chiefly with *Fusarium* and vascular wilts, especially of cotton [much of the previous work on which has been noticed in this *Review*: see above, p. 386], T. S. Sadasivan (pp. 97–101) referred to the essential function of soils as a medium for the growth of micro-organisms and indicated that since many of the obscure phenomena of enzyme chemistry had been clarified, the role of micro-organisms [*R.A.M.*, 34, p. 253] in relation to plant health can now be more closely studied. The uptake of antibiotics by plants [30, p. 334] and the search for systemic fungicides have yielded information of great value, stemming from the apparent derangement of key metabolites by these substances and the part played by heavy metals in the enzyme systems of plant tissues, which is in turn related to the requirements of fungi heterotrophic for vitamins [34, p. 667]. As many fungal wilt toxins are polypeptides a critical study of their amino acid sequences and the associated enzyme systems of the organisms in the presence of heavy metals is desirable. Turning to the *in vivo* toxaemia of fungal wilts, reference was made to the increase in microbial numbers in the rhizosphere of maturing cotton plants, recently observed but not yet interpreted, and the correlation of such observations with the nature of the exudates from plant roots, the further study of which constitutes a basic problem.

Discussing the ecological and the taxonomic problems in *Fusarium* spp., C. V. Subramanian (pp. 102–109) [34, pp. 179, 677, and below, p. 397] referred to previous work on the possible method of perennation of certain soil-borne species and noted that *F. udum* [loc. cit.] survives saprophytically only on tissues which it colonized as a parasite (Agnihothrudu, V., Thesis, Madras University, 1954).

Some aspects of fungal ecology were dealt with by K. Ramakrishnan (pp. 110–116), who reviewed previous work on techniques for studying fungi in soil and considered the chief factors governing their abundance and distribution. The author had found direct correlation between nitrate nitrogen and phosphorus and the numbers of fungi in Vandalur soils and referred to the influence of plant cover on the microflora of the soil [34, pp. 180, 673].

Certain aspects of toxicological studies with special reference to *Fusarium vasinfectum* were discussed by R. Kalyanasundaram (pp. 117–122), who showed that recent work [see above, p. 387] pointed to chemical agents as the cause of wilting rather than physical causes. He referred to research into the early stages of toxaemia [loc. cit.; 32, p. 517] and the resuscitation by iron and manganese amendments to the soil of plants starting to wilt (Varadarajan, P. D., Thesis, Madras University, 1953). Metabolic resistance in cotton plants infected by *F. vasinfectum* was shown to be related to the ascorbic acid and carbohydrate content [34, p. 319]. The writer referred to fusaric [? fusarinic] acid [see above, p. 386], its action on host plants, its greater activity at pH 4·3 than at 7·2, its antibiotic powers [loc. cit.], and the correlation of its appearance with the carbon/nitrogen ratio of the medium. It is

suggested that the early formation of fusaric acid could initiate the production of lycomarasmin by *F.* [*bulbigenum* var.] *lycopersici* in tomato wilt [cf. 33, p. 122], and that *F. vasinfectum* present in the rhizosphere in advance of infection might produce the acid there.

Some aspects of variation and variability in *Fusarium* with reference to the taxonomy of the genus were dealt with by C. S. Venkata Ram (pp. 123–131), who reviewed previous work on the subject (47 references). It has been found that *Fusarium* spp. do not lend themselves to chromatographic techniques such as have been utilized in some other taxonomical studies, but production of specific metabolites in culture may be of some assistance.

Some biochemical aspects of vascular wilts formed the subject of a paper by K. Lakshminarayanan (pp. 132–144), who referred to the uncertain meaning of the term toxin, the use of the more recent term 'vivotoxin' [33, p. 106], and the modern analytical techniques to detect *in vivo* the toxic metabolites in different plant organs [see above, p. 387]. Classifying the phytotoxins in three groups, peptides, quinones, and organic acids, the speaker reviewed previous research and then dealt with the toxic metabolic products of fusarial wilts of cotton and tomato, outlining early investigations. He noted that existing theories of these wilts were either physical or chemical, and summarised both, referring to the recent suggestion that tomato wilt is due to pectin methyl esterase produced by the parasite [33, p. 747]. As regards the production of lycomarasmin [33, p. 122] he considered that the difference in the conditions offered by the host and those of synthetic media may invalidate conclusions drawn from the latter. Reference was made to recent intergeneric grafting experiments [33, p. 566] further supporting the speaker's view that toxic metabolites produced in the host play a vital role in developing wilt symptoms.

Cotton varieties resistant to wilt accumulate more total nitrogen than susceptible ones. Infection apparently prevents the accumulation of non-protein nitrogen in the shoots of the latter, which may be attributable to the oxidative amino acid deaminase, detected in *F. vasinfectum*. The shoots of resistant varieties accumulate organic nitrogen as proteins; thus there is a marked contrast in the non-protein/protein nitrogen ratio of susceptible and resistant plants exposed to infection, a contrast also reflected in the roots. It is suggested that any agent which could accelerate protein synthesis in susceptible shoots might prove a chemotherapeutant for wilt control. Chromatographic studies on the distribution of α-amino constituents, positive to ninhydrine, revealed significant quantities of cystine in shoots, and especially in roots, of resistant varieties, there being none in the susceptible. It was suggested that the cystine forms a chelate with iron available in the host rendering it unavailable for chelation with the toxin, which seems to be the prerequisite for toxigenic wilting. Finally, discussing the role of enzyme systems in wilting, the speaker indicated that cotton wilt symptoms could be reproduced by commercial takadiastase and suggested that the diastatic enzymes of *F. vasinfectum* may account for part of the disease syndrome.

Heavy metal requirements of fungi were discussed by Miss L. Saraswathi-Devi (pp. 145–150) [see above, p. 386] who summarized previous research on the necessity of certain elements to fungi, indicating the difficulties attendant on obtaining absolute purity of chemicals. Using suitable methods, iron and zinc [34, p. 537] were shown to be indispensable to the growth of nine species of *Fusarium*. Sporulation of *F. vasinfectum* increased proportionately up to the highest zinc supply yet tried, but for growth there was a sufficiency level. A certain minimum of zinc was necessary for the production of fusaric acid, but high concentrations inhibited it. The effect of zinc amendments to wilt soils [32, p. 430] is being further investigated. Absence of copper, manganese, or molybdenum did not appreciably depress the growth of a few species used; the possible replacement of iron or zinc by thiamine or biotin seems unlikely.

Respiratory studies on vascular wilts have been made by M. Lakshmanan (pp. 151–154) concerning respiratory changes arising from tissue injury induced by toxigenic wilting. The intensity of respiration was observed to increase after 21 days in susceptible cotton grown on wilt-infested soil, though early vein-clearing symptoms [34, p. 227] appeared in 14 days. It was concluded that the action of both growth substances and toxins on the protoplasmic membrane results in increased respiration [cf. 33, p. 106].

Saksena (R. K.). **Some aspects of studies on soil fungi.**—*J. Indian bot. Soc.*, 34, 1, pp. 1–10, 1955.

In this presidential address, delivered at the 34th annual meeting of the Indian Botanical Society, held at Baroda, 3rd January, 1955, the author, after briefly recapitulating some outstanding taxonomic studies on soil fungi published since the beginning of this century, deals with the subject under the main headings of isolation of soil fungi, ecological aspects, and the biological balance in soil. Such important aspects of the problem as the role of fungi in the decomposition of plant debris, the production of antibiotics, and the occurrence of various soil-borne plant pathogens await the attention of investigators working in teams. A bibliography of 66 titles is given.

Thornton (R. H.). **Rhizoctonia in natural grassland soils.**—*Nature, Lond.*, 177, 4501, pp. 230–231, 1 fig., 1956.

When the mycology of one grassland soil in the North Island of New Zealand and two in the South Island was studied by the screened immersion-plate technique (*Research*, 5, p. 190, 1952) and Warcup's plating method [*R.A.M.*, 29, p. 530] at the Soil Bureau, Wellington, mycelium typical of *Rhizoctonia* [*Corticium*] *solani* predominated in both the topsoil and subsoil on all three sites according to the former method, but not to the latter. Since results with Rossi-Cholodny slides and agar-soil films [27, p. 449] and the direct examination of soil blocks also demonstrated the presence of *Corticium* it would appear that the soil-plating technique is unable to give a true picture of the fungus flora of these soils.

Vukovits (G.). **Die Bedeutung des Bors in der Ernährung unserer Kulturpflanzen.** [The importance of boron in the nutrition of our cultivated plants.]—*Pflanzenarzt*, 8, 11, pp. 91–93, 7 figs., 1955.

The symptoms of boron deficiency on fodder and sugar beets, swedes, cauliflower, celery, apples, and vine are described from the Vienna Plant Protection Institute. On the last-named the disorder has only become widespread of recent years [cf. *R.A.M.*, 34, p. 78]. The deficiency may be remedied in the field and market-garden by soil amendments with 10 kg. borax per ha. or 20 kg. in severe cases, but much larger quantities (upwards of 100 kg. per ha.) are required in the orchard and vineyard, to be repeated at a dosage of 20 kg. at intervals of several years.

Müller (H. W. K.). **Die Bekämpfung der Rostkrankheiten unter Berücksichtigung der neuen organischen Fungizide.** [The control of rust diseases with reference to the new organic fungicides.]—*Gesunde Pfl.*, 7, 2, pp. 21–25, 1955. [Abs. in *Zbl. Bakt.*, Abt. 2, 108, 23–25, p. 732, 1955.]

In nurseries in the Vierlanden district of Hamburg, Germany, four applications of 1 per cent. phytox [based on zineb] or 0·3 per cent. phytox-sulphur at fortnightly intervals between 17th July and 22nd August have proved very effective in the control of gentian and peppermint rusts (*Puccinia gentianae* and *P. menthae* [*R.A.M.*, 32, p. 201], respectively).

Ramakrishnan (T. S.) & Sowmini (C. K.). **Rhizome and root rot of Turmeric caused by Pythium graminicola Sub.**—*Indian Phytopath.*, 7 (*1954*), 2, pp. 152–159, 1 pl., 1955.

In recent years a new disease of turmeric (*Curcuma longa*), characterized by drying of the leaves commencing at the margins, occasional watersoaking of the bases of the aerial shoots, rotting and discoloration of the much reduced root system, and, in advanced cases, soft rot of the rhizomes [*R.A.M.*, 14, p. 146], has been prevalent in the districts of Krishna (Andhra State) and Tiruchirapalli and Coimbatore (Madras). A *Pythium* sp. was isolated. When fresh rhizomes bearing healthy roots were washed in a mercuric chloride solution, inoculated with the fungus, and incubated for a week the roots were completely rotten and the rhizomes also affected. In another series, in which two-month-old potted plants were soil-inoculated, marginal wilting was evident in ten days and death ensued after 18. The roots were rotten and the rhizomes pulpy. The fungus was also pathogenic to seedlings of sorghum, wheat, maize, barley, oats, arrowroot, and cotton. From the results of these and cultural studies the pathogen is identified as *P. graminicola*, a new record for this host in India.

No disease occurred in inoculated soil drenched with Cheshunt compound or 0·1 per cent. ceresan solution at 1 gal. per sq. yd., while 70 per cent. of the plants in untreated plots were affected. In addition affected plants should be eradicated and the soil around neighbouring healthy ones treated as a preventive measure.

Ramakrishnan (T. S.). **Leaf spot disease of Turmeric (Curcuma longa L.) caused by Colletotrichum capsici (Syd.) Butl. & Bisby.**—*Indian Phytopath.*, 7 (*1954*), 2, pp. 111–117, 1 pl., 1955.

For over 30 years turmeric (*Curcuma longa*) in Madras and Andhra States has been affected by a leaf disease characterized by elliptical or oblong spots most evident on the upper surface, enlarging to 1·5 to 2 in. long by 1 to 1·5 in. wide and frequently coalescing to involve most of the leaf, which then dries up. The centres of the spots are greyish-white with a brown margin and an indefinite yellowish halo; acervuli form concentric rings in the centres and sometimes occur on the leaf sheaths also. Cultural studies confirmed the identity of the fungus to be *Colletotrichum capsici* [*R.A.M.*, 32, p. 177]; in inoculation experiments it also infected leaves of cabbage and *Aristolochia bracteata*, seedlings of *Gossypium herbaceum* and chick pea, and fruits of eggplant, *Withania somnifera*, and chilli (*Capsicum annuum*). Thorough spraying early in August with 1 per cent. Bordeaux mixture plus a wetter reduced leaf spot incidence significantly in trials at Bhavani and in the Tiruchirapalli district and increased rhizome yields.

Vaheeduddin (S.), Reddy (D. B.), & Shastri (S. K.). **Sugar-cane rust in Hyderabad State.**—*Sci. & Cult.*, 21, 6, pp. 328–329, 1955.

Sugar-cane rust (*Puccinia kuehnii*) [*R.A.M.*, 33, p. 710], first noticed in Hyderabad State, India, in 1951 on the leaves of a two- to three-months old crop in a small patch near Bodhan, Nizamabad, and since then reported from other parts of Nizamabad, was very severe in 1954–5, particularly on Co. 475. It appears to be spreading slowly.

Burges (A.). **Problems associated with the species concept in mycology.** *ex* Species studies in the British Flora.—pp. 65–82, 4 figs., London, Botanical Society of the British Isles, British Museum (Natural History), 1955.

The author discusses the suitability of classifying the fungi by methods similar to those employed for the angiosperms in view of the much more rapid life cycle of the former and their wide field for variation arising from phenotypic plasticity, mutation, heterokaryosis, and growth in culture. The species concept as it applies to

fungi is considered with reference to such cytotaxonomical information as is available, and to the special problems arising in connexion with certain groups. It is concluded that the problems of species discrimination in the fungi are essentially similar to those of other organisms, even though they may be accentuated by the rate of speciation and greater plasticity.

Lehoczky (J.). **Adatok dunántúl mikrogomba-flórájához.** [Data on the mycological microflora of the Danube region.]—*Bot. Közl.*, 45, 3-4, pp. 235–240, 1954. [Russian and French summaries.]

Fungi, collected in 23 localities during the survey of the mycological microflora of the Danube region of Hungary [cf. *R.A.M.*, 20, p. 596] in 1950, are listed here in systematic order. They included *Plasmopara viticola* on vine, *Pseudopeziza medicaginis* on lucerne [C.M.I. map No. 129], *Uromyces fabae* on *Lathyrus niger*, *Septoria lycopersici* on tomato [No. 108], *Taphrina pruni* on plum and sloe, *Mycosphaerella sentina* on pear, *U. pisi* on pear, and *S. cannabina* on hemp.

Ramakrishnan (T. S.) & Sundaram (N. V.). **Notes on some fungi from South India. IV.**—*Indian Phytopath.*, 7 (*1954*), 2, pp. 140–151, 2 pl., 1955.

This further contribution to the series [*R.A.M.*, 34, p. 550] comprises notes on 20 species of South Indian fungi, nine of them new, and includes *Woroninella umbilicata* (*Synchytrium umbilicatum*) on pigeon pea [*R.A.M.*, 30, p. 55]; *Phakopsora vignae* on *Phaseolus lunatus* [23, p. 42]; *Cercosporina imperatae* on *Imperata arundinacea*; *Septoria erythrinae* on *Erythrina indica*; and *S. lycopersici* [C.M.I. map No. 108] on tomato, a new record for India.

Balfour-Browne (Frances L.). **Some Himalayan fungi.**—*Bull. Brit. Mus.* (*nat. Hist.*), *Bot.*, 1, 7, pp. 187–218, 8 figs., 1955.

This list of fungi from Tibet and India (Nepal and Bhutan) was compiled from collections made by plant-hunting expeditions in 1938, 1947, 1949, and 1952. One new genus (by E. J. H. Corner), 14 new species (including four by Corner), and one new combination are described. Among the records of interest from Nepal are a species very near *Gymnosporangium clavariiforme*, not before recorded in Asia, on fruits of *Cotoneaster* at 3,600 m., *G. padmarense* Balfour-Browne on *Juniperus indica* at 2,850 m., *Puccinia coronata* on *Rhamnus procumbens* at 228 m., *P. graminis* on *Berberis aristata* at 3,000 m., *Sphacelotheca fagopyri* on *Fagopyrum* at 3,000 m., and *Ustilago crameri* on *Setaria* at 4,200 m.; *Taphrina deformans* was found on *Prunus cornuta* [C.M.I. map No. 192] at 2,190 m. in Tibet, *T. pruni* on *P. padus* at 2,250 m. in Kashmir, and *Coleroa daphnes* Balfour-Browne on living leaves of *Daphne* sp. at 4,200 m. in Tibet.

Subramanian (C. V.). **Studies on South Indian Fusaria. IV. The 'wild type' in Fusarium udum Butler.**—*J. Indian bot. Soc.*, 34, 1, pp. 29–36, 10 figs., 1955.

In this further contribution to the present series [*R.A.M.*, 34, p. 677] from the University Botany Laboratory, Madras, 100 isolates of *Fusarium udum* [see above, p. 393] were collected from typical wilted plants of pigeon pea in an experimental plot at the Agricultural Research Institute, Coimbatore. Ten, chosen for a more detailed study, fell into seven broad cultural groups, first cultures showing a wide range of variation, though most isolates were characterized at first by a poor development of aerial mycelium and a prolific production of micro- and macroconidia in pionnotes or in sporodochia. Sclerotia, produced by only a few isolates, were white or bluish and up to 1·5 mm. in diameter. The non-appearance of sporodochia, therefore, in first cultures indicated a deviation from the normal.

The morphological characters of the conidia were, however, much less variable, and are considered to be of diagnostic value. It is concluded that no fixed 'wild type' concept [31, p. 258] can be formulated for *F. udum*.

Cunningham (G. H.). **Thelephoraceae of New Zealand. Part V. The genus Asterostroma. VI. The genus Peniophora.**—*Trans. roy. Soc. N.Z.*, 83, 2, pp. 241–245, 1 fig.; pp. 247–293, 29 figs., 1955.

In a continuation of his studies [*R.A.M.*, 34, p. 678] the author re-describes the two species of *Asterostroma* occurring in New Zealand, viz. *A. persimile* and *A. andinum*. The genus differs from *Corticium* by the presence in the context of stellate setae, coloured structures consisting of three to nine pointed rays radiating from a slightly enlarged central boss.

Twenty-nine species of the genus *Peniophora*, 15 new, are recognized, of which 16 have been collected in New Zealand; a diagnostic key and detailed descriptions, including notes on hosts and distribution, are given. Ten species previously recorded for New Zealand are excluded.

The genus is segregated from *Corticium* by the presence of cystidia, and microfeatures alone are used in distinguishing the species. All the species of *Peniophora* so far examined have a monomitic hyphal structure [34, p. 487].

Săvulescu (T.). **Monografia Uredinalelor din Republica Populară Română. I. Partea generală. II. Partea specială.** [Monograph of the Uredinales of the Rumanian People's Republic. I. General Part. II. Special Part.]—xxiv+ 1,166 pp., 54 pl. (6 col.), 948 figs., Bucharest, Academiei Republicii Populare Române, 1953.

The first volume of this work, representing 25 years' work on the Rumanian Uredinales and bringing together all previous publications [cf. *R.A.M.*, 32, p. 646 *et passim*], comprises seven chapters (each with its own bibliography) dealing, respectively, with morphology, specialization, physiological and morphological changes in infected plants, local geographical distribution, commensal fungi, classification (diagnoses down to tribes, with lists of Rumanian genera in each), and diseases. The final chapter (pp. 141–280; bibliography, pp. 280–329) contains separate sections on the rusts of different crops. An extensive appendix deals with methods of computing the amount of infection present in experimental cereal plantings, and lists strains [of cereals] with different degrees of susceptibility.

The second volume concerns systematy and includes keys, references, synonymy, detailed descriptions, and host and locality records of 437 species. Latin diagnoses of 24 species first recorded from Rumania are given in an appendix.

Săvulescu (T.). **Biologia și distribuția Uredinalelor din Republica Populară Română.** [Biology and distribution of the Uredinales of the Rumanian Peoples' Republic.]—*Anal. Inst. Cerc. agron. Român.*, N.S. 2, 21, pp. 100–137, 1954. [French summary.]

This is a resumé of Volume 1 of the author's monograph on the Uredinales of Rumania [see preceding abstract].

Savile (D. B. O.). **Chrysomyxa in North America—additions and corrections.**—*Canad. J. Bot.*, 33, 5, pp. 487–496, 1955.

Among these additions (species and hosts) to his monograph on the genus *Chrysomyxa* in North America [*R.A.M.*, 30, p. 124] the author distinguishes three new varieties distinct from *C. ledi* var. *ledi* [loc. cit.], namely, var. *glandulosi* on *Ledum glandulosum* and *Picea engelmanni*, var. *groenlandici* on *L. groenlandicum*, and var. *vaccinii* on *Vaccinium parvifolium*. A revised key to the North American species of *Chrysomyxa* is presented.

Canter (Hilda M.). **Annotated list of British aquatic Chytrids (supplement I).**—*Trans. Brit. mycol. Soc.*, 38, 4, pp. 425–430, 1955.

This is a systematic list of 16 species to be added to the original list [*R.A.M.*, 33, p. 504] and some emendations.

Couch (J. N.). **A new genus and family of the Actinomycetales with a revision of the genus Actinoplanes.**—*J. Elisha Mitchell sci. Soc.*, 71, 1, pp. 148–155, 1 pl., 15 figs., 1955.

Streptosporangium n.gen. and its type species *S. roseum* n.sp. are described from soil. Non-motile spores are produced from a spirally coiled sporangium. *Actinoplanes* is restricted to those with motile spores. The two genera, differing distinctly from the other Actinomycetales, are placed in the Actinosporangiaceae n. fam. erected to contain those genera with spores in sporangia. [In *J. Elisha Mitchell sci. Soc.*, 71, 2, p. 269, 1955, the same author proposes that the family name Actinosporangiaceae be changed to Actinoplanaceae because *Actinoplanes* is the type genus.]

Karling (J. S.). **A key to the subgenera of Synchytrium.**—*Proc. Ind. Acad. Sci.*, 64 (*1954*), pp. 248–249, 1955.

This key to the seven subgenera of *Synchytrium* varies from the previous one [*R.A.M.*, 33, p. 118] in that the subgenera of species with the longer and more complex life cycle are placed first.

Lingappa (B. T.). **Resting spore germination in Synchytrium in relation to classification.**—*Amer. J. Bot.*, 42, 9, pp. 841–850, 98 figs., 1955.

In the course of a study of *Synchytrium* spp. in India [*R.A.M.*, 33, p. 118; 35, p. 268] the author collected resting spores of several species at Banaras from September, 1950, to December, 1951, taking them to the United States as dried herbarium specimens of their hosts. At Purdue University, Lafayette, Indiana, they were stored at room temperature for over three years. The sporangia of 18 long-cycled and six short-cycled species [34, p. 678] germinated within five to 16 days when they were sown on 3 per cent. solidified plain agar, dried until they adhered, flooded with fresh charcoal water, and the plates stored at room temperature, the water being replaced at intervals. Where the spores had been carefully separated from their galls and host debris, germination was as high as 70 per cent. but it was only 10 to 30 per cent. where the spores were still within the galls. In each of the above species the resting spores functioned as prosori in germination, giving rise to a superficial attached sorus of sporangia.

Yadava (A. S.). **Some new hosts of Cephaleuros from Bihar.**—*Curr. Sci.*, 24, 4, p. 124, 1955.

A list is given of additional hosts of *Cephaleuros* collected from different localities in Bihar, India [*R.A.M.*, 33, p. 104].

Benjamin (C. R.). **Ascocarps of Aspergillus and Penicillium.**—*Diss. Abstr.*, 15, 8, p. 1299, 1955.

A morphological study at the State University of Iowa of the ascocarps of 29 strains of *Aspergillus* and *Penicillium* [*R.A.M.*, 33, p. 321] indicated that they comprise five genera of the Eurotiaceae, the perfect states of *Aspergillus* being included in *Eurotium*, *Sartorya*, and *Emericella* and those of *Penicillium* in *Carpenteles* and in *Talaromyces*, a new genus erected for the forms having ascocarpic walls of interwoven hyphae. Species not hitherto included in a valid ascomycetous genus have been so assigned as a result of this study.

Sarmah (K. C.). **Mycological branch.**—*Rep. Tocklai Exp. Sta., 1954*, pp. 107–123, [1955].

In this report [cf. *R.A.M.*, 34, p. 821] it is stated that winter spraying with mercury fungicides was ineffective against tea black rot (*Corticium theae*) [also caused by *C. invisum*: loc. cit.; cf. 32, p. 282].

In further experiments on the control of red 'rust' (*Cephaleuros parasiticus*) [*C. mycoidea*: 35, p. 127] four plots of 100 tea bushes were treated as follows at the end of May: plot 1 unsprayed, 2 sprayed with 0·25 per cent. perenox, 3 with 1 oz., and 4 with 2 oz. mercurized copper oxychloride in 2 gals., two applications being made at 16-day intervals. Treatments 2 and 3 had the same degree of infection, i.e., 67·2, taking the untreated control as 100; treatment 4 reduced it to 42·2.

An inoculation experiment with the Tippuk strain of *Nectria* sp. [33, p. 639] was begun in November, 1952, six cuts on one half of each bush being inoculated with pure cultures from the perfect state within one hour of pruning. Perithecia generally developed about five months later. It was estimated that an average of 3 in. die-back resulted from the pathogenic action of the fungus. By July, 1953, infection had increased where the initial starch reserves in the roots were low. These results suggest that this *Nectria* sp. is pathogenic, but attacks only weakened bushes. It produces macroconidia provisionally identified as *Cylindrocarpon* sp. [cf. 35, p. 238] and also red perithecia.

Rice (R. V.), Kaesberg (P.), & Stahmann (M. A.). **The breaking of Tobacco mosaic virus using a new freeze drying method.**—*Biochim. biophys. Acta*, 11, 3, pp. 337–343, 4 figs., 2 graphs, 1953. [French and German summaries.]

An electron microscope study at the Department of Biochemistry, University of Wisconsin, Madison, demonstrated the breakage into smaller units of many particles of tobacco mosaic virus sprayed from a solution on a cold surface and subsequently dried. The diameter of the broken units is the same as that of the original rods, their length distribution is fairly uniform at about 400 Å, and their arrangement is linear. The freeze-drying methods are described in detail. The cause of the breakage is unknown, though the factors which might contribute to it are discussed.

Bhide (V. P.) & Patel (M. K.). **Control of 'damping-off' in Tobacco seedbeds in Bombay State.**—*Indian Phytopath.*, 7 (*1954*), 2, pp. 181–182, 1955.

Tobacco seed-beds and seedling stands in the Kaira district of Bombay State suffer heavy losses from damping-off caused primarily by *Pythium debaryanum* [cf. *R.A.M.*, 32, p. 177], chiefly during July to August when soil temperature and moisture are most favourable to the pathogen. Since 1940–41 experiments have been conducted at the Tobacco Breeding Station, Nadiad, to test the efficiency of approximately six applications of 0·5 and 0·25 per cent. perenox, 0·25 and 0·125 per cent. mycol (a proprietary copper), and 2–2–50 and 3–3–50 Bordeaux mixture in controlling the disease in beds sown with seed of the variety K.49. Every subsequent year the soil was reinoculated with the pathogen. Perenox (0·5 per cent.) gave consistently good control followed by the two Bordeaux concentrations.

Stephen (R. C.). **Barn rot—its cause and control.**—*Rhod. Tobacco* 11, pp. 5–6, 1 pl. (opposite p. 32), 1 fig., 1955.

During curing, tobacco leaves are liable to barn rot due chiefly to *Rhizopus arrhizus* [*R.A.M.*, 27, p. 118], which is capable of attacking only senescent tissue. The optimum temperature for the growth of the fungus is between 90·5° and 95·9° F. with a maximum of 113°, so that barn rot may be prevented by decreasing the time during which the leaf is held at temperatures below 115°, when it is liable to be attacked. Over-mature leaves are more susceptible than immature ones, and it is desirable to fill a barn with leaves of uniform ripeness so that the required colour is achieved simultaneously. Overloading the barn is also conducive to barn rot [17, p. 844] as the movement of air is restricted and the relative humidity reaches levels favourable to fungal development. Ventilation should be given earlier in the curing process when humidity is high outside the barn. If barn rot symptoms

appear, further loss may be prevented by increasing the ventilation, and the temperature to 118° to 120° F.

Adsuar (J.). **A disease of Tomato in Puerto Rico resembling the Brazilian curly top of Tomatoes.**—*J. Agric. Univ. P.R.*, 39, 2, pp. 113–114, 1 fig., 1955.

A virus disease of tomatoes known locally as 'tisis' has been observed in Puerto Rico for several years. Incidence never exceeds 12 per cent. and is generally much lower. It is characterized by severe stunting and marked stiffening and bronzing of the stem and petioles accompanied by downward curling of the tips and margins of the leaflets, which remain small and turn yellow. The plants do not fruit and often wither and die. The disease was readily transmitted by grafting to tomato and *Datura stramonium*, the latter developing symptoms similar to those on tomato but with no bronzing. The symptoms closely resemble those of the curly top disease of tomato reported from Brazil [strain of beet curly top virus: *R.A.M.*, 32, p. 220].

Schicke (P.). **Über eine einfache Versuchsanordnung der Fungizid-Teste mit Phytophthora infestans (Mont.) de By.** [On a simple experimental arrangement of fungicide tests with *Phytophthora infestans* (Mont.) de By.]—*NachrBl. dtsch. PflSchDienst (Braunschweig) Stuttgart*, 7, 7, pp. 120–122, 3 figs., 1955.

A modification of the technique of McCallan and Wellman [*R.A.M.*, 23, p. 34] was used by the author at the Plant Protection Laboratory of C. H. Boehringer Sohn at Ingelheim a. Rhein, Germany, for the testing of fungicides against *Phytophthora infestans* [29, p. 49; 35, p. 321]. Seedlings in the three-leaf stage of the bush tomato Prof. Rudloff were grown in pots on metal trays (60 per tray) over which fitted aluminium covers. A suspension containing 50,000 to 80,000 sporangia gave the maximum infection rate and was applied only to the upper leaf surface. Disease ratings could be determined $3\frac{1}{2}$ days later.

Gäumann (E.) & Naef-Roth (St[ephi]). **Über die chelierende Wirkung einiger Welketoxine. II. Die Verschiebungen der Toxizität durch steigende Zusätze von Asche aus jungen Tomatensprossen.** [On the chelating effect of some wilt toxins. II. The fluctuations in toxicity induced by increasing additions of ash from young Tomato shoots.]—*Phytopath. Z.*, 23, 2, pp. 147–160, 1 fig., 2 graphs, 1955.

The results of further studies at the Federal Technical Institute, Zürich, on the chemistry of the toxins secreted by *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, 34, p. 112 and next abstracts] demonstrated that lycomarasmin is a powerful chelating agent. The toxicity to tomato shoots of a mixture of lycomarasmin [see above, p. 394] and tomato shoot ash was much weaker than that of either alone, suggesting that the two components deactivate one another.

Gäumann (E.), Naef-Roth (St[ephi]). & Kern (H.). **Über die chelierende Wirkung einiger Welketoxine. III. Die Verschiebungen der Toxizität durch steigende Absättigung mit Eisenionen.** [On the chelating effect of some wilt toxins. III. The fluctuations in toxicity induced by increasing saturation of iron ions.]—*Phytopath. Z.*, 24, pp. 373–406, 10 graphs, 1955.

Komplexon III was shown by further experiments in the current series of studies on the toxins of *Fusarium* [*bulbigenum* var.] *lycopersici* to be a more powerful chelating agent than lycomarasmin [see preceding and next abstracts] and by itself to cause a different type of disturbance of the water balance. The saturated lycomarasmin-iron complex and komplexon III-iron complex, however, produce a disturbance of the water balance identical to that of pure lycomarasmin.

Gäumann (E.) & Naef-Roth (St[ephi]). **Die Dosis-Effekt-Beziehungen bei Lycomarasmin und Komplexon III.** [The dose-effect-relations in lycomarasmin and komplexon III.]—*Phytopath. Z.*, 23, 2, pp. 141–146, 2 graphs, 1955.

The dose-effect curves of lycomarasmin and komplexon III present divergent trends, the former logarithmic and the latter linear, and it is concluded, therefore, that the zones of injury of these two toxins [see preceding abstracts] do not overlap completely in young tomato plants.

Mohanty (U. N.) & Mohanty (N. N.). **Target spot of Tomato.**—*Sci. & Cult.*, 21, 6, pp. 330–332, 2 figs., 1955.

Corynespora cassiicola [*R.A.M.*, 32, p. 342] has been identified as the fungus responsible for target spot of tomato observed in different parts of Orissa, India, in 1953 and at the Government Farm, Bhubaneswar, in 1954. The spots, first appearing on the leaf surface as minute yellow discolorations, turn brown with irregular concentric rings or zones and are encircled by a yellowish halo. The fungus was also isolated from leaf spots on *Croton sparsiflorus* and sesame.

Loest (F. C.) & Schaefer (E. E.). **Bacterial wilt of Tomatoes.**—*Fmg in S. Afr.*, 30, 351, p. 308, 1 fig., 1955.

The authors recapitulate the symptoms, means of spread, host range, and control of tomato bacterial wilt (*Pseudomonas solanacearum*), which is particularly prevalent during the summer in the hotter parts of South Africa such as the Natal coast and the Transvaal lowveld [*R.A.M.*, 28, p. 186].

Walter (J. M.) & Kelbert (D. G. A.). **Manalucie, a Tomato with distinctive new features.**—*Circ. Fla agric. Exp. Sta.* S–59, 10 pp., 2 figs., 1 diag., 1953. [Received January, 1956.]

Kelbert (D. G. A.) & Walter (J. M.). **Manalee, a disease-resistant early Tomato.**—Ibid. S-72, 8 pp., 2 figs., 1 diag., 1954. [Received January, 1956.]

Full descriptions are given of the tomato varieties Manalucie and Manalee, the disease resistance of which has already been noted [*R.A.M.*, 33, p. 566; 34, p. 582].

Orłoś (H.). **Przewodnik do oznaczania chorób drzew i zgnilizny drewna.** [A guide to the determination of tree diseases and wood rots.]—376 pp., 71 pl., State Agricultural and Forestry Publisher, Warsaw, 1951. Zł. 10. [Received 1955.]

This is a useful guide book for the determination of tree diseases and wood rots in Poland. It is arranged in alphabetical order of the common names of host plants, separate indexes of Latin equivalents being given.

Redmond (D. R.). **Studies in forest pathology. XV. Rootlets, mycorrhiza, and soil temperatures in relation to Birch dieback.**—*Canad. J. Bot.*, 33, 6, pp. 595–627, 3 pl., 5 diags., 13 graphs, 1 map, 1955.

The bulk of this information on attempts to find a causal organism responsible for die-back of yellow birch (*Betula lutea*) in the Maritime Provinces of Canada, and the effect of soil temperature upon birch mortality has already been noticed [*R.A.M.*, 34, p. 409 *et passim*]. A species of *Cylindrosporium*, isolated from dead yellow birch roots, inhibited the growth of *Mortierella alpina* and *Cephalosporium* sp., also from dead or dying roots.

Hepting (G. H.). **The current status of Oak wilt in the United States.**—*For. Sci.*, 1, 2, pp. 95–103, 1955. [Abs. in *For. Abstr.*, 17, 1, p. 81, 1956.]

The author presents a detailed summary of the current position with regard to oak wilt [*Chalara quercina*: see following abstracts] in the United States from the

aspects of biology, distribution [*R.A.M.*, 34, p. 192], control methods, and the status of control in the various affected States. He considers that any eastern State could eliminate known infection centres and keep annual watch for a fraction of its expenditure on fire control.

Schuder (D. L.). **Distribution of three important insect transmitted tree diseases.** —*Proc. Ind. Acad. Sci.*, 64 (*1954*), pp. 116–120, 4 maps, 1955.

The increasing spread of oak wilt (*Chalara quercina*) [*R.A.M.*, 35, p. 248 and preceding and following abstracts], Dutch elm disease (*Ceratostomella ulmi*) [35, p. 55], and elm phloem necrosis virus [35, p. 129] in Indiana presents a serious problem. Maps based on observations, consultations, and questionnaires are given to show the distribution of each disease in the State.

Bretz (T. W.). **Some additional native and exotic species of Fagaceae susceptible to Oak wilt.** *Plant Dis. Reptr*, 39, 6, pp. 495–497, 1955. [Multilithed.]

In co-operative studies by the Missouri Agricultural Experiment Station and the United States Department of Agriculture exotic tree species collected from various parts of the world and species of restricted distribution in North America were inoculated with a suspension of endoconidia of the oak wilt fungus *Endoconidiophora fagacearum* [*Chalara quercina*: see preceding and following abstracts]. The susceptibility of 16 additional species of oak, *Castanopsis kawakamii*, native to Formosa, and *Lithocarpus densiflorus*, native to southern Oregon and California, was established.

Jones (T. W.) & Bretz (T. W.). **Transmission of Oak wilt by tools.** *Plant Dis. Reptr*, 39, 6, pp. 498–499, 1955. [Multilithed.]

The possible transmission of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: see preceding and next abstracts] from diseased to healthy trees by tools used on both was studied in 1953–4 in the Missouri Ozarks, Butler County. The fungus was transmitted readily by tools artificially contaminated with a spore suspension, about half of the red oaks (*Quercus* spp.) wounded on the bole with axe or saw becoming infected. The percentage of successful transmission was much higher from inoculations made in February, April, and May than from those made in June and July. There was no transmission by tools previously used on wood from diseased trees, indicating that either the fungus was absent from those pieces of wood or it did not adhere sufficiently to the tools.

Fergus (C. L.), Cole (H.), & Stambaugh (W. J.). **The influence of actidione and other chemicals upon the Oak wilt fungus.** *Plant Dis. Reptr*, 39, 6, pp. 491–494, 1955. [Multilithed.]

Of the five chemicals tested at the Department of Botany and Plant Pathology, Pennsylvania State University, University Park, actidione dissolved in malt extract agar at 1 μgm. per ml. completely inhibited spore germination and mycelial growth of the oak wilt fungus, *Endoconidiophora fagacearum* [*Chalara quercina*: see preceding abstracts]; pentachlorophenol, copper sulphate, and sodium arsenite were toxic at higher concentrations. Added at 0·01 μgm. per ml. to previously established growth in a liquid medium, actidione reduced further growth by 76 per cent. The fungus was less sensitive when the chemical was sprayed on the mycelium. However, when sprayed on oak sapwood at 10 μgm. per ml. actidione reduced mycelial invasion by 90 per cent., suggesting its possible value in the prevention of mat formation. Further investigations are warranted on the use of actidione under forest conditions and as a chemotherapeutant for shade and ornamental trees.

Dow (V. B.) & Grow (T.). **Unusual decay in young Oak plantations following early rodent injury.**—*Mich. For.* 12, 2 pp., 1955.

Heart rot caused by *Fomes robustus* was found in a 48-year-old plantation of *Quercus borealis* var. *maxima* and *Q. alba* in the Saginaw Forest, Michigan, probably resulting from mouse damage at an early age. This is the first record of this fungus on oak in the United States.

Hesterberg (G. A.). **Relation of logging injuries to decay and degrade following partial cutting in northern hardwoods.** —*Diss. Abstr.*, 15, 8, pp. 1285-1286, 1955.

Field investigations were made at the Upper Peninsula Experimental Forest, Marquette County, Michigan, to determine the time required for the development of extensive decay at logging scars in sugar maple (*Acer saccharum*). Dissection of mill samples with 10- and 20-year-old scars indicated that the presence of decay was related to the original width of the scar and to the length of the cutting interval. Broken branches less than 4 in. in diameter rarely become infected by decay fungi within 20 years. Larger stubs result in 5 to 8 bd. ft. of cull in 10 years, while 15 to 20 bd. ft. may be lost within 20 years at frayed stubs more than 4 in. in diameter. The fungi infecting logging scars rarely produce fruiting bodies within 20 years following harvest operations.

Isolates of *Corticium vellereum* [*R.A.M.*, 32, p. 289; 33, p. 268], *Daedalea unicolor*, *Polyporus versicolor*, *Tricholoma unifactum*, and *Ustulina vulgaris* were obtained from decay at scars in the trees sampled. Wood-block cultures of *C. vellereum* did not cause decay of maple wood within 22 months under laboratory conditions favourable to the growth of the fungus. *D. unicolor* caused most of the wound-rotting in maples with logging injuries and caused trunk rot averaging 16 bd. ft. within 10 years after merchantable sugar maples were scarred. Defects at logging scars yielded three cultures of *T. unifactum*, this being the first record of this fungus causing trunk rot in sugar maple.

Groves (J. W.) & Bowerman (Constance A.). **The species of Ciborinia on Populus.** —*Canad. J. Bot.*, 33, 6, pp. 577–590, 1 pl., 1 fig., 1955.

Following a discussion of the nomenclatural problems involved in naming the fungi responsible for the ink spot diseases of poplar, it is concluded that the correct name for the species in the east of North America is *Ciborinia* (*Sclerotinia*) *whetzelii* not *C.* (*S.*) *bifrons* [*R.A.M.*, 19, p. 569; 34, p. 682], while *C. seaveri* nom. nov. (syn. *S. confundens*) is proposed for the similar fungus in the west of the continent [loc. cit.] which does not appear to have a legitimate name. Two new species of *Ciborinia* are proposed and described from specimens and notes of the late Professor H. H. Whetzel, namely, *C. pseudobifrons* Whetzel, which appears in abundance on fallen leaves and twigs of *Populus* spp. in Ottawa in the spring and has also been collected in New York and Quebec and on leaves of elm (*Ulmus* spp.). The ascospores measure (7·5) 9 to 13 (16·5) by 3·5 to 5 μ. *C. davidsoniana* Whetzel was found on overwintered leaves of *P. tremuloides* in Colorado and has ascospores (7) 9 to 12·3 by (3) 4·5 to 6 μ. Another species forming black sclerotia on leaves of poplar (*P. nigra* var. *italica*) was identified as *C. acerina*.

Tratamientos de Chopos. [The care of Poplars.] *Montes*, 11, 63, pp. 237–239, 5 figs., 1955.

Brief notes are given on the cause and control of the principal diseases of poplars in Spain [cf. *R.A.M.*, 32, p. 595], viz., spring defoliation due to *Melampsora allii-populina*, *M. castellana* (only on *Populus alba*), and *M. larici-populina* [cf. 33, p. 182], for which spraying the leaves in spring and summer with copper mixture

(Vf–5) at 2 kg. in 100 l. water is recommended. In autumn all fallen leaves must be destroyed. Summer defoliation caused by species of *Phyllosticta*, *Septoria* [*populi*: 24, p. 387], *Marssonina*, and *Hadrotrichum* [*populi*: loc. cit.] is controlled in the same way. Cankers caused by *Dothiorella populina* and *D. populnea* [23, p. 155] are prevented by disinfecting the seedlings with 10 per cent. Bordeaux mixture before planting in the nursery, and brushing them during dormancy with 25 kg. iron sulphate and 3 l. sulphuric acid in 100 l. water, one application being made to the whole plant and a second, 15 to 20 days later, to the affected twigs only.

Banerjee (S.) & Mukherjee (N.). **A disease of Lagerstroemia speciosa (L.) Pers. caused by Marasmius campanella Holterm.**—*Indian Phytopath.*, 7 (*1954*), 2, pp. 118–139, 4 pl., 1 fig., 1955.

Further studies at the Department of Botany, University College of Science and Technology, Calcutta, demonstrated that *Marasmius campanella*, a detailed description of which is given, is a weak parasite of *Lagerstroemia speciosa* [*R.A.M.*, 34, pp. 192, 267], chiefly affecting the sapwood but capable of penetrating the heartwood also. Inoculation experiments on healthy branches of standing *L. speciosa* demonstrated the ability of the fungus to establish itself in the host through wounds in the bark, though the mycelium advanced very slowly. The spores germinated well on the freshly cut ends of *L. speciosa* twigs, infection threads penetrating the host tissues and eventually forming a profuse mycelium within the wood elements.

Kandaswamy (M.) & Sundaram (N. V.). **Septoria leafspot of Manilkara hexandra.**—*Curr. Sci.*, 24, 6, p. 210, 3 figs., 1955.

Septoria hexandrae n.sp. is named [without a Latin diagnosis] as the fungus responsible for leaf spot of *Mimusops hexandra* in the Botanical Garden, Coimbatore, India. The spots are very conspicuous by their blackish-purple appearance with a cacao-brown centre, the colour being more intensive on the upper surface. The pycnidia measure 62 to 93 by 57 to 77 μ and the curved, light brown, two- to five-septate pycnidiospores, bulged at the base, measure 50 by 3 (36 to 68 by 2 to 4·5) μ.

Annual Report of the Department of Forestry of the Union of South Africa for the year ended 31st March, 1954.—38 pp., 1 pl., 1955.

In the section of this report dealing with protection against fungus diseases (pp. 8–9) it is stated that premature thinning of affected stands reduced the severity of outbreaks of *Diplodia pinea* [on pine: *R.A.M.*, 35, p. 57]. Stands of *Pinus caribaea* and *P. longifolia* were damaged by *Armillaria mellea* [loc. cit.] in Middelkop, de Hoek, and Klein Australie plantations, Transvaal. In the Dukuduku plantation, Natal, *Ganoderma colossum* caused further mortality among old *P. hondurensis* and attacked various *Eucalyptus* spp. Dying of *P. taeda* due to *Stereum sanguinolentum* [34, p. 185] is spreading in the Langsnek plantation, Natal.

Bakshi (B. K.). **Diseases and decays of conifers in the Himalayas.**—*Indian For.*, 81, 12, pp. 779–797, 4 pl., 12 figs., 1955.

Twelve fungi attacking conifers in the Himalayas are described with notes on their pathology, cultural characters, and control. *Fomes roseus*, a new record for India, is particularly common on spruce and causes a brown cuboid rot, the cubes easily crumbling to powder under pressure. The affected timber is stained pink with pinkish-brown zone lines.

F. annosus [*R.A.M.*, 32, p. 158; 34, p. 619] is particularly severe on deodar [*Cedrus deodara*] in areas unsuitable for its growth. Planting trees on suitable sites

or, where attacks are severe, forming mixed woods with resistant conifers are recommended. Brushing cut stumps with creosote prevents stump colonization by *F. annosus* [cf. 30, p. 440].

Armillaria mellea [19, p. 369] is mostly saprophytic but may sometimes affect living conifers, though the damage caused is not serious. Maintaining the vigour of the forest plays an important part in the control of the disease. Trenching round infected trees may be beneficial in orchards or for shade and ornamental trees only.

Polyporus tomentosus var. *circinatus* is common on the roots and butts of conifers. On spruce a reddish-brown discoloration of the wood is first noticeable and is followed by tissue disintegration in elongated pockets. Fine, yellowish-brown zone lines are formed. So far no serious damage has been observed, but infected trees should be removed. There is a close association between fungus attack and fire scars.

F. pinicola [34, p. 619] is present throughout the temperate Himalayas on both conifers and hardwoods. It produces heart rot in living trees and brown cuboidal rot in the sapwood and heartwood of dead standing timber. Since the fungus gains entrance through branch stubs, wounds should be avoided. Overmature spruce and fir [? *Abies*] are usually attacked and should therefore be worked on short rotation.

F. robustus, not previously recorded in India, is rare; it was found on fir and spruce, causing a yellowish rot of the sapwood.

Lenzites saepiaria and *L. subferruginea* are usually found in the temperate Himalayas, while *L. striata* [31, p. 95] occurs in tropical and sub-tropical areas, particularly on chir [*Pinus longifolia*].

Poria rixosa is stated to be common, though not serious, in the Western Himalayas, causing decay of conifer logs and stumps.

Polyporus schweinitzii [32, p. 158; C.M.I. map No. 182], previously recorded under names such as *P. saharanpurensis*, *P. sistotremoides*, and *P. tabulaeformis*, has been collected in the last few years in the Chakrata and Almora Divisions, Uttar Pradesh and Bashahr Division, Himachal Pradesh. It is saprophytic on logs and stumps of *C. deodara*, *P. longifolia*, and fir.

Vaartaja (O.). **Phytophthora cactorum in Saskatchewan.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 11, 2, p. 2, 1955.

In 1954 *Phytophthora cactorum* was isolated from dying cuttings of *Caragana arborescens* and damped-off pine seedlings in Saskatchewan, constituting the first record of this disease in Canada. Owing to the slow growth rate of *P. cactorum* in culture (a week-old colony on maize meal agar at 22° C. had a diameter 63 mm.), the author is of opinion that the presence of the fungus may have been overlooked in routine isolations in the past and is more widespread than is believed at present.

Torgeson (D. C.), Young (R. A.), & Milbrath (J. A.). **Phytophthora root rot diseases of Lawson Cypress and other ornamentals.**—*Sta. Bull. Ore. agric. Exp. Sta.* 537, 18 pp., 8 figs., 1 map, 1954.

Most of this information on the root rot of Lawson cypress (*Chamaecyparis lawsoniana*) and its varieties caused by *Phytophthora cinnamomi* and *P. lateralis* has already been noticed from another source [*R.A.M.*, 34, p. 4]. *C. nootkatensis* var. *compacta*, *C. pisifera* and its vars. *filifera*, *plumosa*, and *squarrosa*, and *C. thyoides* proved resistant to both fungi in inoculation tests. It is suggested that disease-free soil should be used for propagating stock.

Vaartaja (O.). **Effect of cellulose pelleting on the germination of seed.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 11, 2, pp. 2–3, 1955.

In tests conducted at Indian Head, Saskatchewan, pine (*Pinus banksiana*) seed was pelleted with dowicell with or without orthocide 75 (75 per cent. captan and 25

per cent. spreading and sticking materials). The resulting germination percentages showed that heavy coats of the sticker methyl cellulose, applied to enable larger quantities of fungicide to be held on the seed, decreased germination. This effect was counteracted by mixing dithane Z–78 [zineb], orthocide 75, or tersan [thiram] with the pelleting material. *In vitro* tests using seeds in dishes with *Pythium debaryanum* demonstrated that only those seedlings which had been pelleted with 20 per cent. fungicide survived.

COCKERILL (J.). **The use of thiram as a control for damping-off of Red Pine.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 11, 4, p. 1, 1955.

In order to investigate the effectiveness of seed treatment against damping-off caused by *Pythium irregulare* and *Rhizoctonia* [*Corticium*] *solani* [see next abstract] at Orono forest nursery, Ontario [*R.A.M.*, 31, p. 412], seed of red pine [*Pinus resinosa*] was pelleted with arasan (50 per cent. thiram), using methyl cellulose (2 per cent.) as a binder [cf. preceding abstract], in the autumn of 1953. Losses due to damping-off in the test seedlings were recorded from 29th May to 30th June, 1954. With 12 oz. thiram per lb. seed, the percentage mortality was 16·1; with 8 oz., 22·6, and with 4 oz., 31·3, compared with 74·4 in the untreated. Under the conditions of the experiment thiram was more effective against *Fusarium* spp. than against *C. solani*. It cannot be ascertained from these tests whether the reduction in mortality was a direct fungicidal action, or the effect of a change in the microbiological balance in the soil adverse to the damping-off pathogens.

VAARTAJA (O.). **Chemotherapeutic action of dibenzothiophene against Rhizoctonia solani.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 11, 4, p. 2, 1955.

Seeds of jack pine (*Pinus banksiana*) were sown in glass jars on 1·2 per cent. agar containing six different fungicides, (*a*) 0·005 per cent. panogen, (*b*) 0·05 per cent. dibenzothiophene, (*c*) 0·05 per cent. fluorene, (*d*) 0·05 per cent. tersan (75 per cent. thiram), (*e*) 0·05 per cent. orthocide 75 (75 per cent. captan), and (*f*) 0·05 per cent. fermate (76 per cent. ferbam), and (*g*) having no addition. After germination the ten best seedlings in each jar were retained and inoculated with *Rhizoctonia* [*Corticium*] *solani* [see preceding abstract] in a piece of agar placed on the top of each. Two weeks later the survival rates for the treatments were (*a*) 8 per cent., (*b*) 100 per cent., and the rest negligible, and in a further two weeks only seedlings in (*b*), 96 per cent., were still alive. In view of the fact that the inoculum was not in contact with the treated media, it would appear that the high protection conferred by dibenzothiophene was of a chemotherapeutic nature.

KIMMEY (J. W.) & LIGHTLE (P. C.). **Fungi associated with cull in Redwood.**—*For. Sci.*, 1, 2, pp. 104–110, 1955. [Abs. in *For. Abstr.*, 17, 1, p. 81, 1956.]

The four northern coastal counties of California contain a growing stock of 49,000,000,000 bd. ft. of redwood (*Sequoia sempervirens*), 23 per cent. of which is cull, almost entirely owing to the heart rots *Poria sequoiae* (a brown cubical pocket rot) [*R.A.M.*, 10, p. 498] and *P. albipellucida* [33, p. 565], a white ring rot newly recorded on redwood. A table based on 495 sample trees from 25 sites demonstrated that in the southernmost county 99 per cent. of the total rot was due to the former but only 45 per cent. in the north (Del Norte county) where the increased incidence of *P. albipellucida* was correlated with the southern limits of *Thuja plicata* [loc. cit.]. Both fungi enter by fire scars, broken tops, and other wounds exposing bole heartwood, but not broken branches.

LYR (H.). **Vorkommen von Peroxydase bei holzzerstörenden Basidiomyceten. (Vorläufige Mitteilung).** [Occurrence of peroxidase in wood-destroying basidiomycetes. (Preliminary communication).]—*Planta*, 46, 4, pp. 408–413, 1955.

Of 103 species of wood-destroying fungi studied in pure culture on a liquid

medium at the Institute for Forest Botany, Eberswalde, Germany, 48 (47 per cent.) were found to produce laccase [cf. *R.A.M.*, 33, pp. 620, 648] and only 13 (12) peroxidase [cf. 18, p. 219]. Included in the latter group were *Fomes igniarius*, *Phellinus* [*F.*] *pini*, *F. robustus*, and *Hypholoma sublateritium*, while small amounts were also demonstrated in *Armillaria mellea*, *Lentinus tigrinus*, and *Gloeoporus* [*Polyporus*] *adustus*. Most of the peroxidase-forming species are capable of disorganizing lignin [18, p. 284], a process known to be accomplished by means of oxidation, and it seems probable, therefore, that the enzyme, like laccase, can be utilized for that purpose. However, a definite conclusion to this effect would be premature in the absence of experimental proof.

Girbardt (M.). **Lebendbeobachtungen an Polystictus versicolor (L.).** [Observations *in vivo* on *Polystictus versicolor* (L.).]—*Flora*, 142, 4, pp. 540–563, 22 figs., 2 diags., 2 graphs, 1955.

The internal structure of the hyphae of a strain of *Polystictus versicolor* isolated from beech was studied under the phase-contrast microscope at the Institute for Microbiology and Experimental Therapy, Jena, Germany. The nuclei contain a dark nucleolus of very variable shape. The shining outer part of the nucleus is fusiform to oval. Chondriosomes and granules were also clearly visible, and nuclear migration and the formation of clamp-connexions and walls were followed. The apical growth appears to be at the extreme tip of the hypha, which has a characteristic apical body. In each cell there are sharply differentiated apical and basal poles. The older mycelial hyphae are assumed to serve mainly as centres for enzyme processes, the actual growth of the fungus taking place only in the apical cells of the main and lateral hyphae.

Zubieta (G.) & Gomez (C. E.). **Estudio comparativo de métodos utilizados en toximetría de preservadores de madera. I. Resistencia natural al decaimiento de Eucalyptus leucoxylon F.v.M. comparada con Quebracho colorado.** [Comparative study of methods used in measuring the toxicity of wood preservatives. I. Natural resistance to decay of *Eucalyptus leucoxylon* F.v.M. compared with red Quebracho.]—Reprinted from *Industr. y Quím.*, 17, 2, 6 pp. 4 figs., 1955.

In the laboratories of the Technical Headquarters of Postal Services and Telecommunications [Buenos Aires], the resistance to decay by *Poria* sp., *Polystictus sanguineus*, a member of the Polyporaceae, *Peniophora* sp., an unnamed basidiomycete, and *Coniophora cerebella* [*C. puteana*] of *Eucalyptus leucoxylon* as compared with the more durable quebracho (*Schinopsis* sp.) was tested by the Leutritz [*R.A.M.*, 33, p. 514], malt agar [28, p. 101], and Badcock's methods [21, p. 176].

The second proved the best for this type of test, except for *C. puteana*, which produced the greatest weight loss in *Schinopsis* samples by the Leutritz method. The latter was shown to provide the most standard conditions for the test. *C. puteana* and the polypore were the most destructive of *Schinopsis*. This species was more susceptible to *Poria* by the Leutritz and Badcock methods and *E. leucoxylon* by the agar method. It is advisable to include in such tests a third, highly susceptible timber species in order to check on any abnormal reaction by the others, and also to use as many test fungi as possible. The results obtained with *Poria* and the polypore by the agar method and *C. puteana* by the Leutritz method permit *E. leucoxylon* to be classed as 'durable' and *Schinopsis* as 'very durable' according to Findlay's classification [18, p. 221].

Russell (P.). **Inactivation of phenyl mercuric acetate in groundwood pulp by a mercury-resistant strain of Penicillium roqueforti Thom.**—*Nature, Lond.*, 176, 4493, pp. 1123–1124, 1955.

In December, 1954, an investigation was begun by Bowaters Development and

Research, Ltd., Central Research Laboratories, Northfleet, Kent, into the storage qualities of ground wood pulp impregnated with 25 to 35 p.p.m. phenyl mercuric acetate compared with unimpregnated pulp in relation to their degradation by blueing and wood-rotting fungi, and to determine why phenyl mercuric acetate, although toxic to many basidiomycetes at low concentrations [*R.A.M.*, 33, p. 60], frequently fails to protect ground wood pulp from attack by 'red rot' after a few months' storage.

Penicillium roqueforti [34, p. 417] isolated from pulp impregnated with phenyl mercuric acetate has been shown to absorb mercury into its mycelium when grown on liquid media containing 20 p.p.m. of the fungicide. Monthly examination of bales of pulp manufactured in December, 1954, showed that stains caused by *P. roqueforti* first appeared in the mercury-treated pulp about eight weeks after manufacture but the fungus was seldom isolated from the untreated. After five months the untreated bales were badly rotted and the treated ones extensively stained. Bioassays of treated pulp revealed that the concentration of biologically active mercury fell from 12 to 13 p.p.m. in the unstained central areas to 3·4 p.p.m. 1 in. beyond the border of these stains and was nil in the stains themselves. In no case was biologically active mercury found in the stained regions of impregnated pulp containing 25 to 35 p.p.m. mercury. *Stereum sanguinolentum* [32, p. 527] was isolated from 'red rot' areas six months from manufacture, and appears to follow the loss of biologically active mercury. It is suggested that *P. roqueforti* renders phenyl mercuric acetate inactive as a fungicide, necessitating the use of a non-mercurial or partly mercurial toxicant as a pulp preservative.

MOORE (W. D.). **Relation of rainfall and temperatures to the incidence of Sclerotinia sclerotiorum in vegetables in south Florida during the years 1944 to 1954.**—*Plant Dis. Reptr.* 39, 6, pp. 470–472, 1955. [Multilithed.]

Data collected over a period of ten years (1944–54) in relation to the severity of *Sclerotinia sclerotiorum* on vegetables in south Florida [*R.A.M.*, 28, p. 45] indicated that the mean daily temperatures in December, January, and February of each year were optimum for apothecial development. Moisture proved the limiting factor during these months, though not during the rest of the year; in October and November disease development was reduced to a very low level by high temperatures, and in March and April by low moisture and high temperature acting together. While causing appreciable losses at infrequent intervals the disease is of less importance on vegetables than other major fungus infections.

JORGENSEN (M. C.) & WALTER (J. M.). **The 1953 outbreak of black rot at Ruskin.**—*Proc. Fla hort. Soc.*, 67 (*1954*), pp. 109–111, 1955.

In December, 1953, an exceptionally severe outbreak of black rot (*Xanthomonas campestris*) occurred on cabbage and cauliflower growing near Ruskin, Florida, on a narrow strip of land about 20 miles long adjoining Tampa Bay. The reduction in yield of marketable cabbage was estimated at 50 per cent. and that of cauliflower at between 50 and 70 per cent. Some of the crops had been grown from seed treated with hot water, but neither seed treatment nor the history of the land appeared to affect the severity or prevalence of the disease.

Abnormally rainy weather prevailed from 1st August to 1st February [1954], this period covering the seed-bed stage and the field time of all crops except the latest. A severe rainstorm accompanied by a wind of exceptional velocity on 24th November may have spread the bacteria, but the origin of the outbreak remains obscure. No black rot developed on seedlings grown from 27 samples of the treated seed [cf. *R.A.M.*, 32, p. 172].

Brandenburg (E.) & Buhl (C.). **Über das Vorkommen von Molybdänmangel bei Blumenkohl in Westdeutschland und seine Bekämpfung.** [On the occurrence of molybdenum deficiency in Cauliflower in West Germany and its control.]—*Z. PflKrankh.*, 62, 8–9, pp. 514–528, 7 figs., 1 map, 1955.

Following a brief review of 25 contributions to the literature on molybdenum deficiency in cauliflower, the authors describe the symptoms of the disorder, its occurrence in western Germany [*R.A.M.*, 34, p. 11], experiments on its control with sodium molybdate, and the reactions of some varieties, among which those of the Alpha group, e.g., Delfter Markt and Gloria, were particularly susceptible, Le Cerf and Erfurter Zwerg being less severely affected on the same soils.

Möllerström (G.). **The influence of the weather on the development of downy mildew in Sugar Beets, with some observations on control measures.**—*Socker*, 11, 2, pp. 31–36, 1 graph, 1955.

The author's study on the connexion between meteorological conditions and the development of *Peronospora schachtii* on sugar beet in Scania, Sweden, covered the period from 1951 to 1954. During July and August, 1951, the humidity considerably exceeded the five-year average from 1946 to 1950, resulting in an increase of downy mildew up to a few per cent., as compared with only 0·1 in the previous decade, and a correspondingly higher incidence in the following spring. The exceptionally high humidity and low temperatures of the 1952 season, particularly in June and July, promoted the rapid spread of the fungus throughout the beet-growing regions. An inventory of a few hundred fields at the end of August disclosed an average of 30 to 35 per cent. infection, with up to 80 per cent. in first-year stands near seed fields. In 1953, notwithstanding heavy initial infection [cf. *R.A.M.*, 17, p. 366], the unusually low humidity and high temperatures of June and July prevented serious outbreaks, and the average at the end of the season remained the same (3 per cent.) as at the beginning. The unfavourable conditions for the pathogen in 1953 were reflected in an improved position in the beet fields during the early part of the 1954 season, when low humidity and high temperatures also helped to hold the disease in check. From mid-June onwards, however, conditions adverse to the host prevailed, leading to a marked increase of infection during the summer, though the damage to first-year beets was negligible, except in stands adjacent to seed fields.

During 1952, 13 tests were made (each on 50 healthy and 50 diseased plants) in 10 factory areas to determine the effects of downy mildew on the harvest. The average reductions in root and top weights and in sugar content were 44, 59, and 3 per cent., respectively.

Promising results in the control of the disease were obtained by spraying with copper-containing preparations, especially 2 per cent. Bordeaux mixture. It is essential to start the treatments early; in 1953 the first was made between 20th and 25th May and followed by two others at fortnightly intervals.

Canova (A.). **Una nuova forma di giallume della Barbabietola.** [A new form of Beet yellows.]—*Phytopath. Z.*, 23, 2, pp. 161–176, 10 figs., 1955. [English and German summaries.]

A new form of beet yellows virus observed in Romagna, Italy [cf. *R.A.M.*, 34, p. 574], in 1953 is characterized on sugar beets in the first place by chlorosis of the veinlets of some central leaves and secondarily by the entire yellowing of those developing subsequently. Hypoplasia of the fibro-vascular bundles and surrounding chlorophyllous parenchyma is the principal anatomical symptom. Other hosts of the virosis, for which the name of 'Romagna yellows' is proposed, include *Beta maritima*, spinach, *Amaranthus retroflexus*, *A. deflexus*, and *Chenopodium murale*.

In transmission experiments with *Myzus persicae* as the vector the new virus

proved to be more infectious than the ordinary form. Thus, after feeding for one hour on infected plants, the percentages of positive transmission were 62 and 34, respectively, and the corresponding figures after six hours 100 and 63, respectively. Attempts to superimpose the Romagna yellows virus on sugar beets already inoculated with the ordinary form were unsuccessful.

Foeppel (W. G.) & Gerhold (N. R.). **Controlling damping-off in Sugar Beets.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 6, p. 49, 1954.

Of 17 compounds tested against *Rhizoctonia* [*Corticium*] *solani* and *Pythium debaryanum* on sugar beets at the Colorado A & M College, manzate proved to be the most efficient. Used at the rate of 8 oz. per 100 lb. seed, its protective effect was found to persist for a year. A laboratory technique devised to save the great loss of time entailed in greenhouse experiments involved the use of aluminium pans, germination pads, inoculated soil, and temperature cabinets. It gave positive results in four days as compared with a fortnight in the greenhouse, the data secured by the two methods being in close agreement [cf. *R.A.M.*, 35, p. 143].

Buxton (E. W.). **Fusarium diseases of Peas.**—*Trans. Brit. mycol. Soc.*, 38, 4, pp. 309–316, 1 pl., 1 graph, 1955.

In further studies at Rothamsted Experimental Station cultures of *Fusarium oxysporum* and *F.o.* var. *redolens* [*R.A.M.*, 35, p. 213], isolated from diseased pea plants in eastern England [34, p. 16], differed in their pathogenicity. Most cultures of *F. oxysporum* behaved like the American physiologic race 1 of *F.o.* f. *pisi* [33, p. 651] when inoculated to pea plants by dipping the roots in a dense spore suspension, but some were only weak pathogens. One, provisionally named race 3A, infected Alaska, Alderman, Dwarf Grey Sugar, and Wisconsin Perfection, all resistant to race 1, and Delwiche Commando and New Era, resistant to race 2. A culture of *F.o.* var. *redolens* caused a wilt indistinguishable from that caused by race 1 of *F.o.* f. *pisi*. Crop failures up to mid-June were caused mainly by *F.o.* f. *pisi* race 1 and from mid-July onwards by the foot rot pathogen *F. solani* f. *pisi*, non-pathogenic forms of which were also isolated. Plants showing characteristic foot rot yielded only *F.o.* f. *pisi*, but towards the end of June many diseased plants bore symptoms of wilt also. This syndrome is considered to be identical with 'St. John's disease' in Europe [14, p. 613; 31, p. 471] and the name might be retained for the double infection occurring at this period. When *F.o.* f. *pisi* race 1 was inoculated to peas together with either pathogenic or non-pathogenic cultures of *F. solani*, the plants were infected less severely than when inoculated with race 1 alone.

Boyer (M. G.). **Variation in the incidence of Ascochyta pisi in Pea seed as influenced by treatment and media.**—*Plant Dis. Reptr*, 39, 6, pp. 475–476, 1955. [Multilithed.]

At the District Seed Testing Laboratory, Canada Department of Agriculture, Ottawa, counts of fungi on germinating pea seeds infected by *Ascochyta pisi* [*R.A.M.*, 35, p. 63] were shown to be influenced by the type of medium and treatment used in testing. The highest counts were obtained from seed washed in running tap water and plated on malt agar. When an [unspecified] nutrient agar was used there were higher counts following treatment with chlorine than with running water, probably because the medium promoted bacterial growth. With infected seedlings tested under the same conditions oatmeal agar gave the highest counts.

Quantz (L.). **Ein Ringfleckenvirus von Buschbohnen.** [A ring spot virus of Dwarf Beans.]—*Phytopath. Z.*, 23, 2, pp. 209–220, 8 figs., 1955.

The development of brown, sometimes circular, necrotic lesions on the younger

pinnate leaves of Doppelte Holländische Prinzess dwarf beans [*Phaseolus vulgaris*] on the outskirts of Lübeck and on the Lüneburger Heide, Germany, at the end of July, 1953, was attributed to infection by tobacco ring spot virus [cf. *R.A.M.*, 18, p. 811; 32, p. 464] and the results of serological and premunity tests did, in fact, demonstrate a close relationship between the virus isolated from diseased plants (which were definitely backward in growth) and the potato ring spot or bouquet strain of tobacco ring spot [32, p. 274].

The bean virus was transmitted by sap inoculation to 59 German and foreign bean varieties, as well as to tobacco, *Nicotiana glutinosa*, *Datura stramonium*, *Gomphrena globosa*, *Chenopodium quinoa*, tomato, and numerous Leguminosae, including pea, sweet pea, soy-bean, white, yellow, and blue lupins, and cowpea. In most of these hosts an acute stage of infection was followed by 'recovery' in the new growth. The inactivation temperature lay between 64° and 65° C., the dilution end point between 1 in 1,000 and 1 in 10,000, and longevity *in vitro* extended over a period of three days. Two variants of the bean virus were isolated, one of which induced more severe and extensive symptoms on tobacco than the other.

Frosheiser (F. I.). **Studies on the etiology and epidemiology of Diaporthe phaseolorum var. caulivora, the cause of stem canker of Soybean.**—*Diss. Abstr.*, 15, 8, pp. 1286–1287, 1955.

Soybean stem canker (*Diaporthe phaseolorum* var. *caulivora*) [*R.A.M.*, 34, p. 126] has increased in prevalence throughout most of the soybean areas of Minnesota since 1951 [31, p. 268]. In studies at the University of Minnesota in 1952, inoculations made by inserting mycelium-bearing toothpicks into the stems of healthy plants generally produced typical symptoms, but this method is not satisfactory for testing for resistance because varieties apparently resistant to natural infection are readily attacked by this method. An agar medium containing ground sweet clover leaves (1·5 per cent. agar) was the best substratum for pycnidia and conidia. Monoconidial isolates produced typical perithecia on potato dextrose agar and typical stem canker symptoms when mycelium was used for inoculum. There was a yield reduction of 10 bush. per acre when Blackhawk soybeans were inoculated by the toothpick method at 70 days, 67 per cent. of the plants being infected. This variety is the most susceptible in Minnesota but no canker has been observed on Ottawa Mandarin, Capital, or Flambeau in commercial fields. However, in a test with the toothpick method Ottawa Mandarin was as susceptible as Blackhawk. Of 16 varieties compared for susceptibility to natural infection in a field at St. Paul, Renville, Blackhawk, and Capital had 7·7, 5, and 2·9 per cent. infected plants, respectively, while Pridesoy 11, Ottawa Mandarin, and Flambeau were symptomless.

Susceptibility increases with age and reaches a maximum after pod formation. Under natural conditions Blackhawk plants sown on 12th and 21st May were more susceptible than those sown on 1st and 10th June. There was no evidence that systemic infection follows seedling infection or using infected seed. Crimson, red, Ladino, and sweet clover [*Melilotus* sp.], lucerne, beans [*Phaseolus vulgaris*], and garden peas all developed symptoms following inoculation with the pathogen. So far it is known to survive only in over-wintered, infected soybean plant parts and seed.

Cox (R. S.). **Compatibility between a streptomycin-terramycin formulation and copper in the control of bacterial blight of Celery.**—*Plant Dis. Reptr*, 39, 6, pp. 484–486, 1955. [Multilithed.]

At the Everglades Experiment Station, University of Florida, Belle Glade, sprays of agrimycin-100 [see next abstract] and copper A (45 per cent. COCS, 4 lb. per 100 gals.) each gave good control of bacterial blight (*Pseudomonas apii*) of celery

[cf. *R.A.M.*, 17, p. 722] in the seed-bed. Used in combination (2 to 4 lb. copper A with 100 to 200 p.p.m. streptomycin) the two materials were completely compatible and more effective than when either was applied alone. Weekly applications of the mixture should give adequate control.

Crossan (D. F.) & Krupka (L. R.). **The use of streptomycin on Pepper plants for the control of Xanthomonas vesicatoria.**—*Plant Dis. Reptr*, 39, 6, pp. 480–489, 1955. [Multilithed].

Agrimycin-100 [*R.A.M.*, 35, p. 25 and preceding abstract] at 250 and 500 p.p.m. streptomycin was tested in the greenhouse at Delaware Agricultural Experiment Station for the control of *Xanthomonas vesicatoria* on [chilli] pepper [34, p. 190]. The antibiotic was not detected in expressed sap from washed leaves of sprayed plants by a bioassay method. A similar test on snap beans [*Phaseolus vulgaris*], using *Pseudomonas* [*medicaginis* f.sp.] *phaseolicola* as the test organism, gave positive results, indicating a varying host response. Even at the higher concentration agrimycin failed to eradicate *X. vesicatoria* from established leaf lesions: at the lower it acted as a bacteriostatic protectant. Frequent spraying at 250 p.p.m. or higher reduced leaf infection.

Mishra (J. N.). **Wilt of Gram (Cicer arietinum L.) in Bihar.**—*Curr. Sci.*, 24, 6, p. 210, 1955.

Wilting of gram (*Cicer arietinum*) plants in the heavy soils of South Bihar, India, sometimes resulting in death of 5 to 10 per cent. of the plants, was found to be due to *Ozonium texanum* which is believed to be identical with *O. t.* var. *parasiticum* [cf. *R.A.M.*, 32, p. 661].

Adsuar (J.). **A mosaic disease of the Yam, Dioscorea rotundata, in Puerto Rico.**—*J. Agric. Univ. P.R.*, 39, 2, pp. 111–113, 1 fig., 1955.

A mosaic disease of yams, first observed near Utuado in Caguana county, Puerto Rico, in August, 1952, has since been seen in other parts of the island. It is characterized by yellow and dark green patches on about half of the leaves, accompanied by slight distortion of the lamina and marked dwarfing of the plant. The best method of transmission was by needle pricking through an infected yam leaf wrapped round a stem or petiole of a healthy plant. The virus was also transmissible to tobacco, [chilli] pepper (*Capsicum frutescens*), and cucumber. The virus withstood exposure for ten minutes at 50° C., dilution to 1 in 1,000, and storage for one month at −5°, but was inactivated at 60° and by dilution to 1 in 10,000. Infectivity was lost in expressed sap before 24 hours at room temperature and after 24 days in infected leaves air-dried in the laboratory.

The disease is probably identical with those previously described in Puerto Rico [*R.A.M.*, 17, p. 300] and Sierra Leone [18, p. 157].

Report Mushroom Research Station, Yaxley, for the year 1954.—35 pp., 9 figs., 11 graphs, 1955.

In the section of this final report (the station has now closed and the work has been transferred to the Glasshouse Crops Research Institute, Sussex) [cf. *R.A.M.*, 34, p. 205] dealing with the work of the microbiology department Miss D. G. Gandy (pp. 24–32) describes experiments on the method of transmission of bacterial pit. Six out of nine test beds were cased with fresh soil, three serving as controls and three being sprayed with a suspension of [unspecified] bacteria, while the remaining three were cased with soil in which pitted mushrooms had grown. After seven weeks there were no pitted mushrooms in the control beds, five in the sprayed, and 88 (out of 212) in the infested soil, but the percentage infection in the latter declined rapidly, indicating unfavourable conditions for the spread of the disease. The

experiment was conducted at a relative humidity varying between 56 and 96 per cent. (average 82) and temperature averaging 70° F. (minimum 65°). In another experiment no clear correlation was found between the incidence of bacterial pit and the type of lime used in casing soil, whether hydrated lime or calcium carbonate.

Samples of yellow moulds obtained from 17 growers were compared with cultures of *Myceliophthora lutea* from France and the United States and none corresponded. Five different moulds were distinguished, of which three appear to be common in compost, but it remains to be established whether they are detrimental to mushroom production.

Wagner (F.). **Über antibiotische Eigenschaften eines an der parasitären Gurkennelke beteiligten Fusarium.** [On the antibiotic properties of a *Fusarium* concerned in the parasitic wilt of Cucumber.]—*Z. PflBau*, 6 (50), 4, pp. 167–173, 1 diag., 1955.

A *Fusarium* belonging to the section Martiella, isolated two years previously from the vascular system of wilted cucumbers [*R.A.M.*, 35, p. 265] at the Bavarian Institute for Agriculture and Plant Protection, Munich, exerted a powerful antibiotic effect on a number of fungi in pure culture, including *Helminthosporium sativum*, *Rhizoctonia* [*Corticium*] *solani*, *Sclerotinia sclerotiorum*, *S. minor*, *Alternaria brassicae* var. *dauci* [*A. dauci*], and *A. tenuis*. On the other hand, only one of the organisms tested, a *Penicillium* of the section Radiata, exercised a comparable action on the *Fusarium*, and that exclusively in malt extract cultures; attempts to protect cucumber plants by means of this antagonist in soil inoculation experiments were unsuccessful.

The *Fusarium* under observation produces macro- and microconidia, the former measuring on an average 50·3 μ in length, together with numerous cream-coloured pionnotes. It may be identical with *F. solani*. The virulence of the species is attributed to its copious secretion of antibiotic substances, the activity of which was not reduced by 30 minutes' boiling of the culture filtrate.

Cox (R. S.). **Cold pox, a disease on Cucumber in South Florida.**—*Plant Dis. Reptr*, 39, 6, pp. 478–479, 2 figs., 1955. [Multilithed.]

Cold pox is a name suggested for a serious new disease of cucumbers in south Florida. Blister-like, light olivaceous areas appear on the fruit, coalescing and becoming dried and fissured with age. The cause of the disease is unknown, but field observations indicate that it is associated with a sequence of variable weather conditions always including a period of low temperature, the minimum necessary being above freezing. With favourable weather the symptoms disappear, but may recur several times during the growing season.

Turian (G.) & Staehelin (M.). **Nouvelles recherches sur le champignon du coître de la Vigne.** [New studies on the fungus causing white rot of the Vine.]—*Annu. agric. Suisse*, N.S., 3 (68), 9, pp. 987–997, 4 figs., 1954. [German, Italian, and English summaries.]

Following a survey of the nutritional relations of *Coniella* [*Coniothyrium*] *diplodiella* and its aneurin [vitamin B_2] and biotin requirements [*R.A.M.*, 34, p. 277 and next abstract], studies are described from the Federal Agricultural Experiment Station, Lausanne, on the effects on the pathogen of commercial antibiotics, substances produced by antagonistic fungi, and synthetic organic products.

None of the antibiotics exerted appreciable anti-fungal activity, while streptomycin and (to a lesser extent) aureomycin actually stimulated sporulation. Species of *Chaetomella*, *Fusarium*, and *Penicillium* produced zones of inhibition exceeding 5 mm. in diameter in Petri dish cultures. Oxyquinoline and various derivatives of

phthalimide and thiram were very active in laboratory tests but failed to confer protection on wounded grapes inoculated with the white rot fungus.

A quantitative method for the isolation of *Coniothyrium diplodiella* from vineyard soils involves the suspension of a 1-gm. sample in 100 ml. water. The resultant product is then diluted 10 times, and from each dilution 0·2 ml. is taken and plated on 3 per cent. grape must agar.

Soil treatment with thiram to inhibit spore formation by the pathogen offers the most promising method of control [34, p. 276].

Turian (G.). **Recherches sur la nutrition, la variation et les propriétés antibiotiques de Chaetomella horrida Oud.** [Studies on the nutrition, variation, and antibiotic properties of *Chaetomella horrida* Oud.]—*Phytopath. Z.*, 23, 2, pp. 113–120, 5 figs., 1955. [German and English summaries.]

A strain of *Chaetomella horrida* isolated from a grape rotted by *Coniella* [*Coniothyrium*] *diplodiella* [see preceding abstract] proved to be auto-auxotrophic for mycelial growth but required a supplement of vitamin B_2 (500γ per l.) for pycnidial maturation. The addition of sodium nitrite to the medium induced 'mutation' of the pycnidial type C strain of *Chaetomella horrida* into a sterile mycelial type M, the stability of which was not impaired by a number of subcultures. There was antagonism between *Coniothyrium diplodiella* and *Chaetomella horrida* which may be enhanced by the culture of the latter on filter paper placed on a culture of the former; it serves as a sole source of carbon and promotes abundant growth and sporulation. Ether extracts of the fungus exerted an antibiotic effect on *Coniothyrium diplodiella*.

Kundert (J.) & Fischer (H.). **Wurzelpilze an Reben.** [Root fungi on Vines.]—*Schweiz. Z. Obst-u. Weinb.*, 65, 2, pp. 23–26, 2 figs., 1956.

Semi-popular notes are given on the symptoms and control of three fungi encountered on vine roots in Switzerland, i.e., *Rosellinia necatrix*, the honey fungus [*Armillaria mellea*], and *Roesleria pallida* [cf. *R.A.M.*, 3, p. 259], of which the first-named is the most prevalent. *Rosellinia necatrix* and *A. mellea* may be controlled by soil sanitation and the use of vigorous rootstocks, such as 5BB; the parasitism of *Roesleria pallida* is doubtful, and so far the writers have detected it only on dead roots.

Bawden (F. C.). **Reversible, host-induced, changes in a strain of Tobacco mosaic virus.**—*Nature, Lond.*, 177, 4503, pp. 302–304, 1956.

At Rothamsted Experimental Station White Burley tobacco seedlings inoculated with the virus causing mosaic of cowpea in Nigeria [*R.A.M.*, 34, p. 624] developed systemic symptoms resembling those of tobacco mosaic virus to which the virus in the tobacco leaves was serologically related. The same virus in Prince beans [*Phaseolus vulgaris*] was only distantly related serologically either to tobacco mosaic or to the cowpea virus obtained from mottled tobacco leaves. The cowpea virus obtained from the two hosts also had different electrophoretic mobilities and that from bean was inactivated by far less exposure to ultraviolet radiation. Cowpea virus obtained from tobacco produced lesions on *Nicotiana glutinosa* similar to those caused by standard tobacco mosaic virus, but that from bean produced lesions that differed considerably; they only became visible after four days, few reached a diameter of 1 mm., and many were entirely white though some had incomplete black rings.

Young tobacco seedlings inoculated with virus from bean at first gave extracts containing the bean form of the virus as indicated by inoculation to *N. glutinosa*, but after five days the tobacco form was detected. Young tomato and *Datura tatula* plants also produced the tobacco form when inoculated from infected beans.

Both forms multiplied locally in leaves of sugar beet, inoculum from beans producing lesions and that from tobacco not. Leaves inoculated from beans first yielded only the bean form, but both were detected after a week.

There was no evidence that the host-induced changes in the virus were due to the admixture of two strains in the culture. Electrophoretic tests with extracts from plants infected with standard tobacco mosaic and with the cowpea mosaic virus indicated that a range of anomalous proteins occurs in infected cells, some probably combining with nucleic acid to give stable infective particles while others do not. In a cell environment where the initial infecting particles are as stable and infective as any others that are synthesized, there may be no change in the properties of the virus, but where they are not they will soon be superseded by any more stable form that is also better fitted to spread from one cell to another.

Anderson (C. W.). **Viruses of vegetable crops and miscellaneous plants in Florida.** —*Proc. Fla hort. Soc.*, 67 (*1954*), pp. 102–105, 1955.

In this account of plant virus diseases in Florida [cf. *R.A.M.*, 34, pp. 431, 580], the author states that locally strains of cucumber mosaic virus [loc. cit.; 31, p. 166] sometimes attack cowpea, Lima bean [*Phaseolus lunatus*], *Impatiens holstii*, *Xanthium orientale*, *Solanum gracile*, and at least one unidentified perennial weed, in addition to the hosts previously recorded.

Ayers (E. L.). **Foreign plant quarantines.**—*Proc. Fla hort. Soc.*, 67 (*1954*), pp. 15–18, 1955.

The author briefly reviews and discusses the history of plant quarantine legislation in Florida since the passing of the Florida Plant Act in 1915, establishing the State Plant Board.

Locke (C. M.) & Watson (Alice J.). **Foreign plant diseases intercepted in quarantine inspection.**—*Plant Dis. Reptr*, 39, 6, p. 518, 1955. [Multilithed.]

The following diseases were intercepted recently on plant material imported by the United States Department of Agriculture through the Washington Inspection House: *Tilletia pancicii* on barley and *Puccinia aeluropi* on stems and leaves of *Aeluropus* sp., both from Turkey, *Neovossia indica* on wheat [*R.A.M.*, 32, p. 365] from Afghanistan, and *P. longicornis* on bamboo [29, p. 603] from Japan.

Jahresberichte der Pflanzenschutzämter 1954. [Annual reports of the Plant Protection Bureaux 1954.]—168 pp., Biologische Bundesanstalt für Land-und Forstwirtschaft, Braunschweig, 1955.

Information (largely covered in this *Review* from other sources) is presented from the Plant Protection Bureaux of Schleswig-Holstein, Hamburg, Bremen, Lower Saxony, North Rhine-Westphalia, Hessen, Rhineland-Palatinate, Baden-Württemberg, and Bavaria on the local incidence of important plant diseases and pests in 1954 [cf. following abstracts] and on administrative and organizational matters, including the direction and execution of campaigns against particularly troublesome pathogens.

Härle (A.). **Die wichtigsten Krankheiten und Beschädigungen an Kulturpflanzen im Bereich der Bundesrepublik Deutschland im Anbaujahr 1954 (Oktober 1953 bis Oktober 1954).** [The principal diseases and injuries of cultivated plants in the zone of the Federal Republic of Germany in the cultivation year 1954 (October, 1953, to October, 1954).]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*) *Stuttgart*, 7, 12 (*Beil.*), 19 pp., 2 graphs, 1955.

The information contained in this report [cf. *R.A.M.*, 34, p. 20] was compiled from the monthly bulletins of the provincial Plant Protection Bureaux in the Federal German Republic [see preceding abstract] and is concerned with the

prevailing weather conditions and the local incidence of well-known diseases and pests in 1954.

Klemm (M.) & Masurat (G.). **Das Auftreten der wichtigsten Krankheiten und Schädlinge der Kulturpflanzen im Jahre 1951 im Bereich der Deutschen Demokratischen Republik.** [The occurrence of the principal diseases and pests of cultivated plants in the year 1951 in the zone of the German Democratic Republic.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 9, 8, pp. 142–167, 1 graph, 40 maps, 1955.

During the period under review [cf. *R.A.M.*, 31, p. 536], biotype G of potato wart (*Synchytrium endobioticum*) [31, p. 573] extended its range in Thuringia owing to the insufficiency of immune planting material. There was an exceptionally heavy increase (25 per cent.) in the incidence of blight (*Phytophthora infestans*) as compared with 1950.

Beet yellows virus spread widely in Saxony-Anhalt, where notifications numbered over 3,000 as against only 11 in the previous year.

Other pathogens which were more prevalent in 1951 than in 1950 included *Sclerotinia cinerea* [*S. laxa*] on stone fruits.

Rapport Annuel de l'Institut National de la Recherche Agronomique, 1952. [Annual Report of the National Institute of Agricultural Research, 1952.]—328 pp., 13 figs., 6 graphs, 1 map, 3 charts, 1955.

In the section of this report [cf. *R.A.M.*, 33, p. 706] dealing with plant pathology (by P. Limasset) it is recorded (pp. 144–155) from the Central Station, Versailles, that the metabolic products of a *Penicillium* were found to contain, in addition to patulin, another antibiotic, more active against *Ustilago zeae* [*U. maydis*]; attempts to extract and purify this substance are in progress. Exposure to infra-red rays reduced infection of barley [? seed] by loose smut [*U. nuda*] by 10 to 12 per cent.

Eyespot of wheat (*Cercosporella herpotrichoides*) was more serious in 1951–2 than for many years previously. The 1952 epidemic is attributed to spore production at the end of winter and to weather conditions exceptionally favourable to infection. The most prevalent physiologic race of wheat stem rust (*Puccinia graminis*) in France was 21 [34, p. 217] followed (in order) by 17, 186, 14, 133, and 40. Of these, race 40 is the most virulent, but in 1952 it was confined to the south-east of France. It would appear to have come from Italy, where it is very common. More than half the isolations were of races 17 and 21; race 21 also occurred in Morocco. The mild race 186 is common on most varieties grown in France. Experimental inoculations with race 21 showed that satisfactory infection can be obtained one month before the rust normally appears in the vicinity of Paris, indicating that the progress of infection from south to north is slow, even when climatic conditions are favourable. Some serious but localized outbreaks of *Dilophospora graminis* [*D. alopecuri*: on wheat] occurred in Alsace.

Potato blight [*Phytophthora infestans*] was present in Brittany throughout the summer; certain strains isolated from various hybrids were more virulent than those which attack the most commonly cultivated varieties.

In vivo studies on *Cercospora beticola* on beet [34, p. 694] showed that the fungus may persist on diseased plant debris in the soil during winter, the conidiophores remaining alive and producing conidia as soon as climatic conditions permit. Abundant sporulation was obtained on inoculated soil. Seed beets also play an important part in the over-wintering of the fungus. The first infections found in root crops at the Experimental Farm were near seed-bearers. On the lesions sporulation occurs at 7° [C.], is active at 15°, and ceases at 35°, the optimum being between 20° and 26°. At the optimum temperature the spores appear to mature

in 48 hours, but they become detached only with difficulty, even after three days. This partly explains why infection spreads so slowly from a centre of infection. In natural conditions sporulation often occurs very slowly; it lasted for more than ten days on lesions which appeared on 23rd July. In other *in vivo* experiments the conidia were not killed after three days at 40° and 100 per cent. humidity. A *Cercospora* isolated from clover was highly virulent to beet.

Satisfactory disinfection of colza seed contaminated with *Phoma lingam* was obtained by dusting with various organo-mercuric products and others with a thiram or dichloro-naphthoquinone base, used at 400 gm. per quintal. It was ascertained that *P. lingam* can grow at temperatures between 4° and 30° (optimum 25°), and *Alternaria brassicae* at 2° to 30° (23°).

From the Plant Pathology Station, Antibes, it is reported that the part played by *Vermicularia* [*Colletotrichum*] *dianthi* in the premature wilting of carnations near Nice has now been confirmed. Further work on root rot (*Rosellinia necatrix*) of jasmine showed that the optimum temperature for growth is between 22° and 23°. Applications of neutral *o*-oxyquinoline sulphate, phenylmercury nitrate, thiram, and a quaternary ammonium compound to the base of jasmine plants two to 12 days after infection gave effective control.

At the Plant Pathology Station, Colmar, healthy vines grafted with scions affected by court-noué [35, p. 271] developed endovascular cordons in the same year, in many cases before any external symptoms appeared. Kobber 5 BB developed variegation when inoculated with a strain of court-noué from variegated vines; with a strain from vines not showing variegation, no definite symptoms appeared, although the growth rate was reduced and cordons were present. The number of cordons varied with the variety and stock, Kobber 5 BB having five times as many as Traminer.

Overseas news.—*Commonw. phytopath. News*, **2**, 1, pp. 9–11, 1956.

In notes from Canada in this series [cf. *R.A.M.*, 35, p. 283] I. L. Conners (pp. 9–10) describes the current position with regard to barley leaf diseases. During 1955 spot blotch (*Helminthosporium sativum*) [*Cochliobolus sativus*], net blotch (*H.* [*Pyrenophora*] *teres*) [loc. cit.], speckled leaf blotch (*Septoria passerinii*) [loc. cit.], and scald (*Rhynchosporium secalis*) [28, p. 562] were all prevalent in western Canada. For several years leaf diseases have been favoured by cool, damp weather, while the use of the combine harvester-thresher ensures uniform distribution of infected plant debris over the field. The new varieties Scott 169, Lethbridge 23, and Lethbridge 27 show good resistance to *R. secalis*. Hybrids produced in Manitoba are less affected by *C. sativus* than those bred in Saskatchewan, where the disease is less serious.

C. J. Magee (p. 10) reports from Australia that broad bean wilt virus, first described by Stubbs in Victoria [27, p. 5], and later attacking broad beans, sweet peas, and other ornamentals in New South Wales, has been successfully transmitted by *Myzus persicae*. The virus is also sap-transmissible and has a thermal inactivation point of 58° to 60° C. During 1955 a new disease, now shown to be of a virus nature, made its appearance on subterranean clover in widely scattered localities in south-eastern Australia, causing stunting and a reduction in size of the central leaves.

According to H. C. Smith (pp. 10–11), in trials in Western Samoa [*R.A.M.*, 35, p. 287] the average cost per acre of spraying cacao trees with Bordeaux mixture or cuprox against *Phytophthora palmivora* was £1 an application for bucket spray pumps or 10*s*. for swingfog machines.

Work by R. H. Cammack (p. 11) in Nigeria on seedling reaction of maize to *Puccinia polysora* [35, pp. 81, 165] indicates that a new rust strain has appeared in West Africa, which may affect the present breeding programmes.

Banana leaf spot [*Mycosphaerella musicola*], of which only the *Cercospora* state has been identified, was observed in the Gold Coast and Togoland.

Foster (W. R.) & MacSwan (I. C.). **Report of Plant Pathology Branch.**—*Rep. B.C. Dep. Agric., 1954*, pp. Z42–Z45, 1955.

In this report [cf. *R.A.M.*, 34, p. 433] it is stated that the spray programme generally adopted against apple scab [*Venturia inaequalis*: 34, p. 629] in British Columbia, lime-sulphur to the pink stage, wettable sulphur plus ferbam in the cover sprays, and ferbam in late summer, was evidently satisfactory. Control appeared to be improved by the addition of surface-active materials, and ziram sprays in conjunction with these should be tested further. Nirit [32, p. 666] caused 10 per cent. russeting on McIntosh apples, and karathane caused a heavy attack of 'pin-point scab'.

The antibiotic sprays agri-strep and agrimycin [34, p. 529; 35, p. 158], used at 100 p.p.m. and applied at the 'balloon' and full-bloom stages, prevented fireblight [*Erwinia amylovora*] of Bartlett, Anjou, and Boussock pears in the blossom stage.

For corky core, drought spot, and die-back of apples caused by boron deficiency [33, p. 708] the treatment recommended is one spray per season of 5 lb. boron compound per acre in a concentrate sprayer (1 lb. per 100 gals. in dilute sprayers) as soon as the leaves are well developed, or to broadcast 30 lb. boric acid per acre on the soil every three years (10 lb. annually on very light soils).

Leaf blotch of apples due to magnesium deficiency [35, p. 303] may be controlled by four applications of magnesium sulphate to trees in full foliage, preventive treatment being one spray per season of 20 lb. magnesium sulphate per acre in concentrate sprayers (2½ lb. per 100 gals. in dilute). Similarly an application of 8 lb. manganese sulphate per acre (or 2 lb. per 100 gals.) is recommended to counteract interveinal chlorosis of apples. Against little leaf and rosette of apples, due to zinc deficiency, zinc sulphate should be applied as a dormant spray before spraying with oil, 36 per cent. zinc at 25 lb. per acre or 12½ lb. per 100 gals., 32 per cent. at 28 lb. or 14 lb., and 22 per cent. at 40 lb. or 20 lb.

Little cherry virus [35, pp. 158, 200] appears to cause more damage in the Kootenays and Arrow Lakes region than in the Creston Valley. In preliminary trials promising results were given against *Botrytis* fruit rot of strawberries [*B. cinerea*] by captan (2½ lb. per 100 gals.) [35, p. 159]; dithane Z-78 was ineffective.

British Columbia remains virtually free from bacterial ring-rot of potatoes [*Corynebacterium sepedonicum*: loc. cit.]. The estimated loss from potato late blight [*Phytophthora infestans*] in the Fraser Valley was 10 to 15 per cent., the highest since 1948.

Progress Report 1949–1953, Horticulture Division, Central Experimental Farm, Ottawa.—205 pp., 22 figs., 1 diag., 9 graphs, 1955. [Received March, 1956.]

In the section of this report [cf. *R.A.M.*, 30, p. 15] dealing with fruits L. P. S. Spangelo describes (pp. 18–19) the work done in a co-operative project started in 1949 to determine the possibilities of developing commercial apple varieties resistant to scab (*Venturia inaequalis*) [34, p. 433]. The isolates used in the inoculum differed in pathogenicity from those used at Purdue University [31, p. 189]; the Alexis variety, resistant in Indiana, was susceptible at Ottawa. The evidence so far obtained indicates that modifying factors are present in all the sources of resistance used. The segregation data do not appear to support the results reported by other workers. In the first crosses Geneva (*Malus pumila* var. *niedzwetzkyana*, open-pollinated) was the main source of resistance [cf. 34, p. 731]; later, R 12740–7A (*M. pumila*), Jonathan × (Rome Beauty × *M. floribunda*) sib, Wolf River × *M. atrosanguinea*, Wolf River × *M. prunifolia*, Wealthy × *M. prunifolia*, and Wolf River × *M. micromalus* were included. Over 2,500 highly resistant seedlings have

been developed and are being submitted to a fruiting test. Some were very susceptible to mildew (*Podosphaera leucotricha*) at the Smithfield Substation.

In strawberry breeding for resistance to foliage diseases (pp. 23–24) the same author used a photographic scale of six infection classes to rogue seedlings susceptible to leaf spot (*Mycosphaerella fragariae*) [35, p. 160]; the percentages of progenies in classes 1 (no symptoms) and 2 for the selfed plants were: Sparkle 80·5, Fairfax 91·8, and Premier 98·9, the corresponding figures for all crosses being 72·7, 86·2, and 91·5. Fairfax and Premier are evidently superior to Sparkle as parental material for leaf spot resistance.

A. W. S. Hunter and S. H. Nelson, dealing with the indexing of strawberry plants for the control of virus infections [34, p. 630], report (pp. 24–26) that most strawberry varieties grown in Canada appear to tolerate virus diseases; this has rendered the effective roguing of plants in the early stages of infection almost impossible. Since 1949 over 1,500 plants from approximately 400 Ottawa varieties and selections have been indexed. The results confirm the view that the earlier introductions from the Division are completely infected. In 1950, when field-testing was discontinued, the practice of growing new seedlings and standard varieties in contiguous blocks was abandoned, with the result that no other strawberries were within a distance of half a mile and no commercial plantings within two miles. In 1950, of 110 varieties or clones indexed, 108 were completely healthy; in 1951, the corresponding figures were 76 and 73; and in 1952, 87 and 86. Stocks for distribution are grown from indexed plants, and are never more than two years in the field at Ottawa.

L. P. S. Spangelo reports (pp. 26–28) that 5,258 raspberry seedlings from 1948 crosses all proved very susceptible when inoculated with anthracnose (*Elsinoe veneta*) [33, p. 468] in 1949 by spraying the foliage with an aqueous solution of the conidia under optimum conditions for fungal development. A large percentage of the seedlings from crosses of the Ottawa raspberry, very susceptible to powdery mildew (*Sphaerotheca humuli*), with Muskoka and Tweed (both moderately so) were in classes 3 and 4 (medium and heavy infection, respectively). Ottawa × Rideau also gave many susceptible seedlings. Milton appeared to be a good parent for resistance, the most promising progeny being that from a cross with Madawaska, which yielded 68·8 per cent. uninfected seedlings.

A large number of raspberry seedlings, mostly from crosses between the Ottawa varieties, were tested for susceptibility to spur blight (*Didymella applanata*) [loc. cit.]. Progeny differences were not apparent, and vigorously growing seedlings with many canes had more infection than those with fewer. Susceptibility appeared to be correlated with number of canes and amount of foliage.

It is reported by A. W. S. Hunter (pp. 28–29) that the black currant variety Consort (formerly 0–396) [30, p. 508] from Kerry × *Ribes ussuriense*, immune from rust (*Cronartium ribicola*), is susceptible to mildew (*S. mors-uvae*) [32, p. 174]. A black currant plant grown from seed obtained from Poland and a variety from a nurseryman in Saskatchewan were highly resistant to mildew at Ottawa.

M. Macarthur (pp. 71–72) gives experimental evidence to show that mycorrhiza are not necessary for the early growth of low-bush blueberry seedlings (*Vaccinium* spp.).

In the section (pp. 120–135) dealing with low temperature research P. A. Poapst (pp. 126–128) describes experiments on the control of fungal wastage in stored fruit [35, pp. 104, 160]. Considerable success in controlling [unspecified] wastage in Linda apples was obtained when wraps, size 100 sq. in., were impregnated with 0·0055 gm. per wrap of orthohydroxybiphenyl plus 0·24 gm. of a glyceride oil. The shelf life of strawberries held at 75° F. was increased by at least 50 per cent. by perchloroethylene, trichloroethylene [loc. cit.], peracetic acid, and sodium orthohydroxybiphenyl. The chlorinated hydrocarbons were applied as gases at

1 in 10,000 to 1 in 20,000 for 24 hours on the basis of volume of liquid hydrocarbon to free air-space in the container. Perchloroethylene at concentrations over 1 in 10,000 damaged the fruit. Aqueous dips of peracetic acid (38·5 per cent. active ingredient) and sodium orthohydroxybiphenyl (85 per cent.) were equally effective at concentrations from 0·3 to 0·9 per cent. and 0·05 to 0·15 per cent., respectively, though the former caused some bleaching at 0·6 per cent. or more. These treatments reduced the average mould count (Howard method) by 75±12·5 per cent. The best control of wastage in peaches caused by *Monilia* [*Sclerotinia*] *fructigena* and *Rhizopus* strains was secured by holding at low temperatures (40°).

W. Ferguson, L. H. Lyall, and J. J. Jasmin describe (pp. 136–137) breeding work with beans (*Phaseolus* spp.) and report that field inoculations with *Pseudomonas* [*medicaginis* f.sp.] *phaseolicola* [34, p. 433] and *Xanthomonas phaseoli* [loc. cit.] on over 100 varieties, including segregating material, failed to demonstrate any useful degree of resistance to either. The supposedly resistant varieties Full-green and Red Mexican were susceptible to the isolates of *P.m.* f.sp. *phaseolicola* used at Ottawa. The late, indeterminate types like Princezna, Chili Concarne, or Hidatsa Red, and the *Phaseolus multiflorus* [*P. coccineus*] types like Scarlet Runner and Best of All appeared to be less susceptible than *P. vulgaris* var. *nanus* and dwarf types.

Emerson 51, Emerson 847, Cornell 49–242, and Cornell 29-245 were resistant to most of the single-spore isolates of *Colletotrichum lindemuthianum* [30, p. 15] grown by the Division. Emerson 51 is a Tendergreen type, and was crossed with Topcrop, Contender, Red Mexican, Pacer, and Puregold. Following three inoculations of the progeny under controlled greenhouse conditions, 18 per cent. of F_4 plants (a total of 5,025 plants) were classed as resistant to the α, β, and γ strains of the fungus [35, p. 261], as compared with 80 per cent. for the F_5. This rapid progress towards complete resistance indicates that there are good possibilities of obtaining new varieties of beans resistant to the three fungus strains.

A new technique for inoculating cucumber plants with mosaic virus, the 'spray-gun method', produced infection in all the susceptible plants tested, as compared with only 47 per cent. for the ordinary abrasion method. In this technique carborundum 320 is mixed with a solution of 5 gm. of macerated, young, growing tissue, including leaves from infected plants, in 100 ml. of water. This is sprayed at 50 lb. pressure on to the cotyledons of the young plants, the nozzle of the spray gun being held approximately 1 in. away. Following inoculation by this method, percentages of infected plants were: susceptible Marketer, 100, and the mosaic-resistant varieties Ohio MR 17, Ohio MR 25, China, Tokyo Long Green, Yorkstate, Hicrop, Niagara, Wisconsin SM R 12–9, and Wisconsin SM R 12–3, 88, 61, 62, 37, 27, 14, 12, 1, and 0, respectively.

Over 1,000 plants of *Cucumis* spp. and a number of cucumber varieties were tested under greenhouse conditions for their reaction to bacterial wilt (*Erwinia tracheiphila*); resistant plant selections were made in each of the following accessions from South Carolina: AODAI#1, P.I. 196477, P.I. 197085, P.I. 200816, P.I. 200817, and R.W. 255.246–2–4.

Studies were begun on the inheritance of resistance in peas to a single form of *Ascochyta pisi* [34, p. 200], using Wilt Resistant Thomas Laxton × A–100. There was an almost perfect fit to a 15 to 1 ratio of resistant to susceptible plants, which would indicate the possibility of duplicate genetic factors, only one of which is needed for resistance.

The results of other breeding work (pp. 148-152) indicated that a satisfactory degree of resistance to the common strain of *Phytophthora infestans* may be bred into commercial varieties of the tomato [cf. 35, p. 245].

N. M. Parks states (pp. 180-181) that since 1940 evaluations of resistance to common scab (*Streptomyces* [*Actinomyces*] *scabies*) [35, p. 158] have been made

on 8,514 unselected and 167 scab-resistant seedlings from the potato breeding programme at Fredericton, New Brunswick. In two years in four different areas F 1413-223, F 1514-32, F 1713-9, Ontario, and Seneca had under 2 per cent. type 1 infection, compared with 29·48, 3·22, 2·97, and 1·4 (types 1 to 3) in non-resistant Katahdin.

Report of the Department of Agriculture, N.S.W., for the year ended 30th June, 1954.—79 pp., 20 figs., 1954.

In the Plant Pathology section of the report, submitted by the Biological Branch of the Division of Science Services (pp. 45–49) [cf. *R.A.M.*, 34, p. 283; 35, pp. 162, 351], it is stated that of 74 new plant diseases recorded during the year, lemon crinkle leaf virus [loc. cit.] has potential economic significance.

Grey speck of oats [manganese deficiency], first recorded in the previous year, was not observed again. Following a survey of the quarantine areas at Bathurst it appeared that *Ustilago maydis* had been eradicated from the maize crops there.

Colletotrichum trifolii [loc. cit.], first recorded in the previous year, was not observed again on clover. The hereditary abnormality, mottle leaf, present in some lines of Tweed Wonder bean, was almost eliminated by rejecting affected stocks under the Seed Certification Scheme.

Promising resistance to potato scab (*Actinomyces scabies*) was shown by the United States varieties Ontario and Menominee in the Spring Hill resistance trials from 1947 to 1953. In the Tamworth district a newly recorded *Phytophthora* potato tuber disease caused losses of 3 to 40 per cent. in the crop.

Fusarium solani f. *cucurbitae* [cf. 35, p. 343], the agent of cucurbit root rot, survived in a sandy loam soil for 28 months. This disease was only recorded once during the past year, apparently originating from infected seed.

The mushroom disease caused by *Dactylium dendroides* [*Hypomyces rosellus*: 35, p. 71] was observed for the first time.

Citrus [vein] enation virus [cf. 34, p. 781] was discovered to be present in the State, but no detrimental effect on the host was noticed.

Lemon crinkle leaf virus was identified on the Lisbon lemons Belaie and Villa Franca at Narara Citrus Experiment Station and on 48-year-old Eureka lemons at Gosford. The infection occurred in pedigree trees and is under investigation.

A bacterium isolated from mandarin [orange] affected by brown spot was considered to be responsible for the disease; zineb gave promising indications of control.

The peak period for perithecial maturity of *Venturia inaequalis* on apples coincided with petal-fall for the sixth successive season. Thiram is recommended as the most suitable alternative to lime-sulphur under conditions of severe infection. After treating three heavily infected Delicious apple trees just prior to leaf-fall with 0·5 per cent. sodium DNC, 0·5 sodium pentachlorophenate, and 0·3 phenyl mercuric chloride, the last-named prevented *V. inaequalis* from entering the saprophytic phase and no inoculum was produced for reinfection in the spring.

Symptoms of apple mosaic virus were common during the season, showing a disturbing increase in incidence. Three years have elapsed since the last record of *Coccomyces hiemalis* on cherry.

Uredospores of *Puccinia antirrhini* remained viable for 116 days at low temperature and humidity, though longevity decreased with a rise in these; viable spores could, therefore, have been introduced with seed [cf. 34, p. 285].

Barooah (S. R.). **Annual Report of the grow more food campaign of the Department of Agriculture, Assam, for the year 1953–54. Part II.** ii + 155 pp., 1955.

In the plant protection section (pp. 49–55) of this report [cf. *R.A.M.*, 34, p. 81] it is stated that the spraying of 2,115 acres of potatoes in the Sibsagar area with

perenox (2 to 4 lb. per 100 gals. water) or Bordeaux mixture (4-4-50) against *Phytophthora infestans* [loc. cit.] and *Alternaria solani* [34, p. 517] resulted in a 10 per cent. increase (1,068 tons). In certain parts of Sibsagar and Lakhimpur there were epiphytotics of *A. solani* which caused serious damage.

Similarly, koleroga (*Phytophthora arecae*) on areca palm [loc. cit.] was severe in the Katlicherra area of the Cachar district. Removing all affected sheaths and spraying some 7,000 plants with perenox (4 lb.) or Bordeaux mixture controlled the disease. About 1,650 severely infected and badly damaged plants were cut down and destroyed.

Tarr (S. A. J.). **Plant pathology.**—*Rep. Res. Div. Minist. Agric., Sudan, 1951–1952*, pp. 71–80, 1954. [Received 1955.]

In this report [cf. *R.A.M.*, 33, p. 411] it is stated that cotton blackarm (*Xanthomonas malvacearum*) [33, p. 537] was widespread and more severe than recently, secondary rather than primary (seed-borne) infection being responsible. The disease was carried by unauthorized transport of parts of cotton plants and plant products into newly irrigated areas of the Gezira where cotton had not been cropped before.

Cotton leaf curl virus [loc. cit.] was very abundant on Sakel cotton in the northern Gezira, the whitefly vector [*Bemisia gossypiperda*] being widespread. A suspected virus disease was occasionally observed on lubia [*Dolichos lablab*] in the Gezira. In experimental plots leaf spotting due to *Ascochyta phaseolorum* was present on *Phaseolus trilobus* and on green gram (*P. mungo*), *Macrophomina phaseoli* on black gram (*P. m.* var. *radiatus*), and typical virus symptoms were noticed on both grams.

Among fungi of interest not previously recorded from the Sudan were *Alternaria brassicae* on turnip, *A. brassicicola* on radish, *A. citri* on citrus, *Cordana musae* and *Helminthosporium torulosum* [C.M.I. maps Nos. 168 and 175] on banana, *Melampsorella* [*Melampsora*] *ricini* [*R.A.M.*, 32, p. 591] on castor [*Ricinus communis*], and *Puccinia sorghi* on maize [map No. 279].

Dumbleton (L. J.). **A list of plant diseases recorded in South Pacific territories.**—*Tech. pap. sth. Pacif. Comm.* 78, 78 pp., 1 map, 1954. 2*s*. [French translation. Multilithed. Received September, 1955.]

This useful list of parasites (including viruses) and hosts includes the territories in which they have been recorded [cf. *R.A.M.*, 32, p. 304]. Interesting records from Australian New Guinea include *Ceratostomella* [*Ceratocystis*] *paradoxa* [C.M.I. map No. 142] on pineapple; a mosaic virus on groundnut; *Xanthomonas campestris* [No. 136] on crucifers, also recorded from Norfolk Island and New Caledonia; *Armillaria mellea* [No. 143] on tea and coffee; *Phytophthora parasitica* on citrus; *Xanthomonas malvacearum* [No. 57] on cotton; *Ceratostomella* [*Ceratocystis*] *fimbriata* [No. 91] on sweet potato; *Septoria lycopersici* [No. 108] on tomato; *Fusarium oxysporum* var. [f.] *cubense* [No. 31] and *Cercospora musae* [*Mycosphaerella musicola*: No. 7] on banana, also noted from Wallis Island and Norfolk Island, New Caledonia, and Netherlands New Guinea; tobacco leaf curl virus [No. 147] and tobacco ring spot virus [No. 144] on tobacco; *Physalospora* [*Glomerella*] *tucumanensis* [No. 186], *Helminthosporium sacchari*, and *Ustilago scitaminea* [No. 79] on sugar-cane; *Phytophthora infestans* [No. 109] on potato, also recorded from Norfolk Island and New Caledonia, and from Cook Islands on tomato; *Puccinia sorghi* [No. 279] on maize, also recorded from New Caledonia and Norfolk Island.

Other records include groundnut rosette virus [No. 49], maize streak virus, and *H. sacchari* on sugar-cane, all from Fiji, and *Elsinoe fawcetti* [No. 125] on citrus from Cook Islands, American Samoa, and New Caledonia.

Roane (C. W.) & Fenne (S. B.). **Some new plant disease records for Virginia.**—*Plant Dis. Reptr*, 39, 9, pp. 695–696, 1955. [Multilithed.]

The following diseases are reported to be new records for Virginia: speck rot (*Stysanus stemonites*) [*R.A.M.*, 29, p. 433] on potato [22, p. 12]; downy mildew (*Sclerospora macrospora*) [cf. 35, p. 292], destroying 40 per cent. of wheat, oat, and barley grains in a field in Henrico county; a barley leaf spot of undetermined origin, possibly physiological, characterized by linear to circular spots, 0·1 to 10·0 mm. in size and chocolate-brown throughout, or lighter-centred with a brown margin; yellow leaf blister (*Taphrina populina*) [34, p. 608] of Lombardy poplar (*Populus nigra* var. *italica*); the *Peridermium* stage of needle rust of loblolly pine (*Pinus taeda*) due to *Coleosporium laciniariae* [23, p. 245]; a soil-borne wheat mosaic [35, p. 175], first observed in Accomac county in 1954 and again in 1955; and stalk rot (*Pythium butleri* [*P. aphanidermatum*]), first observed on maize [22, p. 203] in Mathews county in 1955, affecting the hybrid varieties Ohio C-54 and Southern State Pocahontas.

Gibson (T.). **The taxonomy of the genus Corynebacterium.**—*Atti (VI) Congr. int. Microbiol., Roma, 1953*. 1, 1, pp. 16–20 [? 1954. Received 1955.]

In this critical discussion of the problems involved in the taxonomy of the genus *Corynebacterium* [*R.A.M.*, 33, p. 471], the author considers proposals made to assign generic status to a number of smaller groups within the coryneform bacteria, one group comprising plant pathogens. Attention is drawn to the conflicting views held at present.

Kunicki-Goldfinger (W.). **Zmienność u bacterii.** [Variation in bacteria.]—*Acta microbiol. polon.*, 3, 3, pp. 199–347, 3 pl. (between pp. 338–339), 4 figs., 8 diags., 6 graphs, 1954. [Russian and English tables of contents.]

This number is devoted entirely to results of an exhaustive study of bacteria, including their relation to higher organisms and differences between their environmental systems. It is divided into 11 chapters, dealing with: I, the chief problems of the study of bacterial variation; II, the individual and the species in bacteriology; III, classification of bacterial variations; IV, the adaptive variation of development; V, the regenerative-involutionary heteromorphosis; VI–IX, directed adaptive variation, parts I–IV; X, the problem of sexuality and hybridization; and XI, the evolutionary process in bacteria. A bibliography of 784 titles is appended.

Buchanan (R. E.). **Taxonomy.**—*Ann. Rev. Microbiol.*, 9, pp. 1–20, 1955.

In this paper, which deals mainly with bacteria, the author succinctly reviews and discusses, with 107 references to the literature published between 1948 and 1954, inclusive, (*a*) the taxonomy of micro-organisms; (*b*) recent progress in the clarification of rules of nomenclature through the development of biological nomenclatural codes, with citation of some results; and (*c*) the efforts made to stabilize nomenclature in certain taxa.

Barbezat-Debreuil (Suzanne) & Salmon (Janine). **Identification de la weddellite et mise en évidence de l'ion ammonium dans les tumeurs expérimentales de Pelargonium zonale.** [Identification of weddellite and demonstration of the ammonium ion in experimental tumours of *Pelargonium zonale*.]—*C.R. Acad. Sci., Paris*, 242, 9, pp. 1215–1217, 1956.

The application of the X-ray diffraction (Debye-Scherrer) method to tumours induced on *Pelargonium zonale* stems by inoculation with *Agrobacterium tumefaciens* [*R.A.M.*, 33, p. 284] revealed the presence of calcium oxalate monohydrate (whewellite), ammonium oxalate monohydrate, and a new calcium oxalate

designated weddellite and variously referred to the quadratic, trihydratic, and dihydratic systems.

Calcium oxalate monohydrate crystals are formed in abundance during the early stages of neoplastic growth and tend to regress towards the end of the process, while those of weddellite follow an inverse trend, increasing with the age of the excrescences. Ammonium oxalate monohydrate crystals are formed later and disappear earlier than those of the calcium oxalates.

Bitancourt (A. A.). **La nature des auxines des tumeurs végétales.** [The nature of the auxins of plant tumours.]—*Ann. Biol., Paris*, 30, 7–10, pp. 361–370 (101–110), 6 diags., 1954.

At the Centre for Research on Plant Cancer, Biological Institute, São Paulo, Brazil, the chief auxins in extracts of tumours on various plants inoculated with *Agrobacterium tumefaciens* were identified by means of paper chromatography as indole-acetic acid, its ethyl ester, and indole-acetonitrile. From a qualitative aspect at least, auxin metabolism is similar in both normal and tumorous tissue [cf. *R.A.M.*, 35, p. 167].

Van Lanen (J. M.), Baldwin (I. L.), & Riker (A. J.). **Attenuation of crown gall bacteria by cultivation in media containing lycine.**—*J. Bact.*, 63, 6, pp. 715–721, 2 graphs, 1952. [Received 1955.]

At the Department of Plant Pathology, University of Wisconsin, earlier observations on the effect of glycine on the growth and virulence of *Agrobacterium tumefaciens* [*R.A.M.*, 20, p. 248] were confirmed. Growth was inhibited by 0·1 per cent. glycine in both synthetic and natural media. Complete loss of virulence followed continued cultivation in media containing sufficient glycine to suppress growth. In glycine media of pH 5·5 or less attenuation and growth inhibition was not appreciable.

Van Lanen (J. M.), Riker (A. J.), & Baldwin (I. L.). **The effect of amino acids and related compounds upon the growth, virulence, and enzyme activity of crown gall bacteria.**—*J. Bact.*, 63, 6, pp. 723–734, 3 graphs, 1952. [Received 1955.]

The influence of amino acids and related compounds on the growth and virulence of *Agrobacterium tumefaciens* [see preceding abstract] was investigated at the Department of Plant Pathology, University of Wisconsin. Growth was inhibited by the following substances in decreasing order: α-amino-*n*-butyric acid, threonine, norvaline, valine, norleucine, isoleucine, glycine, serine, alanine, D-leucine, L-leucine, lysine, and diglycine. Growth was stimulated by dicarboxylic amino acids. Slight reversal of growth inhibition by amino acids was achieved by liver extract. Following 25 transfers in glycine media, only 2 per cent. of the stock cultures regained their virulence compared with 70 per cent. after 17 transfers.

Gorlenko (M. V.), Voronkevich (I. V.), & Uspenskaya (Mme G. D.). К биологии **Pseudomonas tumefaciens**—возбудителя корневого рака растений. [Concerning the biology of *Pseudomonas tumefaciens*—the causal agent of crown gall of plants.]—Микробиология [*Microbiology, Moscow*], 23, 3, pp. 322–330, 1 fig., 1954.

Studies at the Moscow Station of Plant Protection, U.S.S.R., on the biology of *Pseudomonas* [*Agrobacterium*] *tumefaciens* showed that there was a rapid loss of pathogenicity of the bacterium in sterilized and unsterilized soil, both with a neutral reaction, in the absence of tomato plants. At pH 5 or less tomato plants could not be infected by means of infested soil, nor could pathogenic cultures of the bacterium be isolated from it. Six *Penicillium* strains, belonging to *P. rugulosum*, *P. stipitatum*, and two other species, all antagonistic to *A. tumefaciens*, were isolated from

the root zones of healthy and diseased apple trees and constituted 17·1 per cent. of the total number of isolates.

It is suggested that fruit tree seedlings can be protected by applying appropriate fertilizers to produce an acid soil reaction, by introducing antagonists underneath the plants, or by soaking the roots with their culture liquids.

KATZNELSON (H.). **The metabolism of phytopathogenic bacteria I. Comparative studies on the metabolism of representative species.**—*J. Bact.*, 70, 4, pp. 469–475, 10 graphs, 1955. [Received April, 1956.]

A study made at the Bacteriology Division, Department of Agriculture, Ottawa, of the oxidation of various substrates by intact cells and cell-free (sonic) extracts of 19 species representing five genera of phytopathogenic bacteria [*R.A.M.*, 35, p. 159] revealed that all oxidized glucose, though at different rates. All except the six *Xanthomonas* spp. tested utilized gluconate; only the two species of *Agrobacterium*, *A. tumefaciens* and *A. rubi*, and also *Erwinia amylovora* utilized 2-ketogluconate. Pyruvate, acetate, and succinate were used by all except two of the species of *Corynebacterium*. *C. michiganense* and *C. flaccumfaciens*; *C. fascians* [35, p. 168] was able to utilize all three. Carbon dioxide was produced anaerobically from glucose only by the two *E.* species tested, *E. amylovora* and *E. carotovora*. Six species of *Pseudomonas* were included.

The results are discussed in relation to the oxidative pathways of glucose and glucose-6-phosphate metabolism.

EISENSTARK (A.) & BERNSTEIN (L. B.). **Specificity of bacteriophages of Xanthomonas pruni.**—*Phytopathology*, 45, 11, pp. 596–598, 1 fig., 1955.

At Kansas State College 212 strains representing numerous species of *Xanthomonas* were tested by a method already described for susceptibility to a bacteriophage of *X. pruni* [*R.A.M.*, 30, p. 313; 32, p. 670], using a mixture of six types of varying lysogenicity [35, p. 4]. The only strains to undergo lysis were 13 out of 16 of *X. pruni*, the remaining three being naturally lysogenic; previous studies had shown that a lysogenic strain of *X. pruni* was resistant to the phage types tested [loc. cit.]. It is concluded, therefore, that the bacteriophage is specific to *X. pruni* and its use may provide a ready means of identification. Species of *Xanthomonas* are difficult to recognize by the usual methods and some, e.g., *X. pruni* and *X. lactucae-scariolae*, are distinguishable only by pathogenicity tests. A phage typing procedure therefore is desirable. In the present study *X. lactucae-scariolae* failed to lyse when treated with the test phages.

NAUNDORF (G.). **Contribuciones al problema de la moniliasis en Cacao.** [Contributions to the problem of moniliasis in Cacao.]—*Cacao en Colombia*, 3, pp. 35–61, 5 figs., 1954. [English summary. Received September, 1955.]

Studies on *Monilia roreri* on cacao in Colombia [*R.A.M.*, 34, p. 774; 35, p. 359 and next abstract] by the Research Section of the National Cacao Company revealed that on trees with many affected pods the incidence of cherelle wilt [34, p. 139] was greatest. The use of fungicides against *M. roreri* [loc. cit.] is inadvisable as they increase cherelle wilt and reduce cacao yields; control must therefore comprise rigid crop sanitation and the destruction of diseased pods. The soil is considered to be an important source of infection, and fungicidal treatment of it reduced the number of diseased pods.

LÓPEZ F. (R.). **Fisiologiá de la germinación de esporos de Monilia sp.** [Physiology of spore germination in *Monilia* sp.] *Cacao en Colombia*, 3, pp. 183–207, 8 figs., 1 graph, 1954. [English summary. Received September, 1955.]

Studies at the Phytopathology Laboratory, Valley Faculty of Agronomy, and

at the Experimental Station, Palmira, Colombia, of the factors affecting spore germination in the cacao pathogen, which the author refers to as *Monilia* sp. because it has not been shown conclusively that *M. roreri* is the pathogen [see preceding abstract], revealed that age was an important limiting factor. High germination percentages were obtained with one- to two-day-old spores but very low with mature spores three to eight days old or more. Spores from pods germinated better than those from cultures. Of various methods tested for isolating the fungus the most effective was to disinfect fragments of diseased pods for one minute in 2·5 per cent. sodium hypochlorite, wash for five minutes in sterile water, and transfer to potato dextrose agar; after 48 hours good mycelial growth was obtained. The best germination was secured with drops of spore suspension on cover-slips, vaseline-sealed over specimen tubes holding water. After 12 hours in 1 per cent. soil filtrate or double-distilled water (pH 6) the germination of young spores was increased by more than 50 per cent. as compared with that in ordinary distilled water, mycelium developing after 22 hours. Germination was also stimulated by 1 p.p.m. vitamins B_1 and C; pH 6 was the optimum: light had no effect. Spores germinated in moist air: liquid water was not necessary, the optimum relative humidity for germination being 80·5 per cent. A temperature of 22° C. was more favourable than 32°.

Idrobo Mazorra (S.). **Represión del Colletotrichum theobromicolum Delacroix en Theobroma cacao L.** [Control of *Colletotrichum theobromicolum* Delacroix in *Theobroma cacao* L.]—*Cacao en Colombia*, 3, pp. 141–156, 5 figs., 1954. [English summary. Received September, 1955.]

In view of the increasing incidence of foliar anthracnose of cacao (*Colletotrichum theobromicola*) in the Cauca Valley, Colombia [*R.A.M.*, 33, pp. 282, 593 and below, p. 430], and its importance in nurseries, a series of experiments was conducted to test the efficiency of various fungicides in its control. In preliminary trials the pathogenicity of cultures isolated from diseased leaves was tested by inoculating seedlings of clone S.C.P. No. 6 in the laboratory. Typical symptoms appeared six days after incubation for 36 hours, being accompanied by chlorosis if incubated for 48 hours; the pathogen was re-isolated.

In tests on the efficiency of the fungicides in improving the rooting of cuttings [see next abstract] and in preventing anthracnose on the young plants, dithane Z-78 was effective for both purposes, but no material inhibited sporulation by *C. theobromicola*. No other fungicide improved rooting, but in controlling anthracnose copper oxide, fermate, and DNC were effective, though less so than dithane.

García Brand (J. R.). **Efecto del dithane Z-78 y del acido 3-indol butirico en el enraizamiento de estacas de Cacao.** [Effect of dithane Z-78 and 3-indolebutyric acid on induced root formation in Cacao cuttings.]—*Cacao en Colombia*, 3, pp. 157–166, 4 figs., 1954. [English summary. Received September, 1955.]

Experiments at the Agricultural Experiment Station, Palmira, Colombia, on the effect of various concentrations of dithane Z-78 and 3-indolebutyric acid on the rooting of cacao cuttings [*R.A.M.*, 35, p. 4 and preceding abstract] indicated that the best results were obtained by dipping the cuttings in a dithane solution (8 gm. per gal.) and then to a depth of about 1 cm. in a solution containing 5 mg. 3-indolebutyric acid per ml. 50 per cent. alcohol. Dithane alone was phytotoxic.

Holliday (P.). **A test for resistance to Marasmius perniciosus Stahel.**—*Rep. Cacao Res. Trinidad, 1954*, pp. 50–55, 3 figs., 1955.

A rapid method for testing the resistance of cacao seedlings to *Marasmius perniciosus* [*R.A.M.*, 34, p. 775; 35, p. 82] was evolved at the Imperial College of

Tropical Agriculture, Trinidad. Following four days' germination of the seed, with the testa removed, in a damp chamber the seedlings were inoculated by dipping in a fresh basidiospore suspension of the pathogen, a concentration of 200,000 spores per ml. being found the most suitable. Immediately after inoculation the seedlings were potted and grown in an open greenhouse. Seedlings from clones known to be susceptible in the field developed 100 per cent. infection, while those from highly resistant or immune selections grew into healthy plants.

Proceedings of the West African International Cacao Research Conference held at the West African Cacao Research Institute, Tafo, Gold Coast, 12th to 16th December, 1953.—100 pp., 7 diags., [? 1954. French summaries. Received November, 1955.]

In this report of the first West African International Cacao Research Conference, M. Meiffren (pp. 6–8) contributed [in French] a brief account of investigations on pests and diseases of cacao in French West Africa and outlined the distribution of cacao swollen shoot virus [*R.A.M.*, 35, p. 360] in the Ivory Coast [34, p. 87].

T. W. Tinsley (pp. 20–21) discussed the strains of cacao swollen shoot virus occurring in West Africa [see next abstract], stating that so far the disease had not been reported from Sierra Leone, Liberia, French Togo[land], Dahomey, the Cameroons [35, p. 170], or the Fernando Po–San Tomé group of islands. All the strains of cacao swollen shoot for which vectors have been demonstrated are transmitted by mealybugs [30, p. 219]. Relationships between the strains cannot as yet be determined serologically. At the West African Cacao Research Institute there were over 70 virus isolates representing differing types of infection in cacao. Strains from Nigeria fall into three or four groups, those from the Eastern Province of the Gold Coast into three groups, and those from Ashanti, Gold Coast, and from the Ivory Coast into two groups. The strains from the Western Province of the Gold Coast are very complex and numerous, and appear to bear little relationship to each other.

The same author (p. 22) outlined the host range of the cacao swollen shoot virus complex [35, p. 360]. During the previous two years some 21 species out of 90 potential hosts in the order Tiliales had been intensively studied for their reactions to swollen shoot; infection was recorded in nine of them [loc. cit.].

Swollen shoot control in Nigeria was dealt with by R. B. Allnut (pp. 23–25) [35, p. 169]. A recent outbreak had occurred at Ilaro, beyond the cordon, involving about 8,000 acres. A greater knowledge of the virus was required before further large-scale control measures could be planned.

The history of the swollen shoot disease at the West African Cacao Research Station, where it was first discovered in 1939, was outlined by R. J. Benstead (pp. 25–28). In areas of low initial infection the loss from the disease in the period 1940–5 was 2·74 per cent. where infected trees and contacts were removed, compared with 32·14 where no control had been practised. In the period 1945–51 treatment from the outset in an area of high initial infection (32·5 per cent.) resulted in 42·58 per cent. loss, in one of [unspecified] low initial infection, 7·63 per cent., and on an untreated plot, 92·2 per cent. Following carefully supervised rehabilitation by concurrent cutting out and replanting there was only 0·3 to 0·48 per cent. new infection after eight years. Blocks re-established after complete clearing showed infection only on the perimeter, varying in accordance with the degree of adjoining infection.

A. E. Moss (pp. 28–32), dealing with swollen shoot disease in the Gold Coast [loc. cit.], described the growth and operation of the control organization, which cannot be maintained indefinitely, and farmers must eventually be educated to maintain control unaided.

Work by C. A. Thorold (pp. 53–56) on the control of black pod (*Phytophthora*

palmivora) of cacao in Nigeria has been noticed from other sources [loc. cit.; 35, p. 361 *et passim* and next abstract].

Cacao die-back in the Cameroons [34, p. 86] was dealt with by J. GRIMALDI (pp. 56–58) [in French]. Macroscopic features of the disease, which is caused by capsid injury in association with *Calonectria rigidiuscula* [cf. 35, p. 169], include elongated, dark-brown, lenticular spots on young shoots and suckers, and cracks and depressions in the bark of woody branches. The disease was becoming increasingly serious but may be controlled by combined treatment with BHC and Bordeaux mixture.

E. BUYCKX (pp. 58–60) stated [in French] that cankers on three-year-old cacao trees at Yangambi in the Belgian Congo in 1950 were due to secondary infection by *Lasiodiplodia* [*Botryodiplodia*] *theobromae* and *C. rigidiuscula*, following insect damage. Trees in favourable environmental conditions were not affected.

J. A. R. MACLEAN (pp. 64–66) discussed some chemical aspects of black pod disease in West African Amelonado cacao, indicating possible uses for beans infected by *P. palmivora* and other fungi. The fat content of diseased beans is as high or higher than healthy ones, suggesting that either the fungi invading the cotyledons do not attack the fat, or they synthesize a fat which is extractable by the usual solvents. The free fatty acid content varies strikingly between healthy and infected beans and may rise from about 1 per cent. in the former to 20 per cent. in the latter. The products of commercial value which could be extracted from diseased material are cacao butter and theobromine and their utilization deserves serious consideration.

Notes on some cacao swollen shoot virus outbreaks in Nigeria were presented by R. M. LISTER (pp. 89–90), the control technique there having involved much more drastic clearing than the removal of infected trees and a few contacts, as practised in the Gold Coast. Estimates of infection made by eye and subsequently checked by graft transmissions indicated that symptoms are not always evident on trees which are infected.

J. R. G. SUTHERLAND (pp. 90–94) in some observations on mealybugs infesting cacao in the Western Region of Nigeria from 1950 to 1953 noted that a species of *Aspergillus* which was isolated from a single mealybug (*Ferrisia virgata*) caused 88·2 per cent. mortality in two colonies of 24 and 27 of the same mealybug [cf. 29, p. 294].

Report of the Cocoa Conference held at Grosvenor House, London, 13th to 15th September, 1955.—xiv+149 pp., 24 graphs (13 col.), 9 col. maps. London. The Cocoa, Chocolate and Confectionery Alliance Ltd., [1955].

In this report [cf. *R.A.M.*, 35, p. 169] J. D. BROATCH (pp. 90–95) gives some notes on disease and pest control and plans for the rehabilitation of the cocoa industry in the Gold Coast. The main points included the education of the farmers in the early detection and reporting of cacao swollen shoot; the reduction of crop losses from black pod [*Phytophthora palmivora*: see preceding abstract] by removing diseased pods, regular harvesting, and spraying in certain areas; and instruction on the benefits of planting in lines. The policy for the control of swollen shoot has remained unchanged. It is estimated that although losses from black pod are less severe than in Nigeria, 10 per cent. of the crop, representing 20,000 tons of cocoa, are lost annually from this disease in the Gold Coast. Large-scale field trials on the control of *P. palmivora* by three-weekly sprays with a copper fungicide were carried out in 1954, using high volume hand sprayers on pods only (such as were reachable with a 6 ft. lance) and low volume shoulder-mounted Kiekens Dekker sprayers for overall applications. Results were not so encouraging as those obtained in Nigeria. During the trials it was observed that the most severe losses occurred early in the season, up to 60 per cent. of the infections originated at the stem end. First-year spraying was economic only on heavy-bearing and heavily infected farms

and no loss of crop occurred from fungicide damage to flowers, cherelles, or pollinating insects. Field trials are in progress to test the efficiency of removing diseased pods more frequently, coupled with fortnightly spraying and harvesting, heavier applications of perenox, and combined perenox and gammalin (anti-capsid) sprays.

The development of fungicidal spraying in Nigeria against black pod disease in cacao [loc. cit.] was dealt with by J. R. G. Hadland and H. W. Reeves (pp. 96–99), details of which have already been noticed from other sources [loc. cit.; 34, p. 584].

[R. G.] Orellana and [L. R.] Siller (pp. 127–129) contributed a paper on studies of cacao diseases at the Cacao Centre, Turrialba, Costa Rica [35, p. 359]. In field trials for the control of *P. palmivora* the yields in plots treated with Bordeaux mixture were significantly better than those sprayed with perenox, crag, or the untreated, which did not differ, while phygon treatment was significantly inferior to the others.

In studies on the biology and control of *Colletotrichum theobromicola* [see above, p. 427], three mutant forms of the fungus, varying in pathogenicity, were isolated. On young cacao seedlings exposed to four light intensities spotting by *Colletotrichum* was greatest on those subject to full sunlight. In various parts of tropical America a widespread disease of the flower cushion, known as buba or cushion gall, has been observed, but its etiology remains obscure. In Costa Rica sudden death of mature cacao trees is possibly associated with a species of *Stilbum* or *Fusarium*.

Havord (G.). **Lime-induced chlorosis of Cacao seedlings.**—*Rep. Cacao Res. Trinidad, 1954*, pp. 72–76, 2 graphs, 1955.

In a pot experiment at the Imperial College of Tropical Agriculture, Trinidad, cacao was grown successfully in soil containing up to 30 per cent. calcium carbonate provided that there was adequate organic matter as a surface layer or incorporated in the soil, indicating that lime-induced chlorosis is not due to the insolubility of iron in conditions of high pH [*R.A.M.*, 33, p. 661; cf. 34, p. 805].

Last (F. T.). **The spore content of air within and above mildew-infected cereal crops.**—*Trans. Brit. mycol. Soc.*, 38, 4, pp. 453–464, 1 fig., 3 graphs, 1955.

Studies at Rothamsted Experimental Station, using a portable volumetric spore trap [*R.A.M.*, 34, p. 664], demonstrated that in addition to *Erysiphe graminis* [35, p. 152] the most abundant spores in the air over mildew-infected wheat and barley crops were those of *Cladosporium*, *Alternaria*, *Sporobolomyces* [35, p. 291], and *Tilletiopsis* [loc. cit.]. On dry days the last two were most numerous at 4 a.m., the other three at 4 p.m. *Sporobolomyces* predominated on wet days, when *Alternaria* did not occur. *Cladosporium* spores were most numerous between 12 and 4 p.m. on dry days, their concentration increasing progressively from April to July. *E. graminis* conidia were sparse in April and May but increased rapidly to a maximum in June. *Alternaria* was also very sparse until July and *Ustilago* spores (mostly *U. nuda* and *U. tritici*) in smutted barley and wheat were sparse in April and May but abundant in June and July. The spore concentration was always greater within than above the crop when the spores were formed on it, though *Erysiphe* and *Cladosporium* were more numerous near the ground; *Ustilago* concentrations showed little difference. *Cladosporium* and *Sporobolomyces* were more numerous in an early- than in a late-sown wheat crop, the differences being least near harvest time. *Erysiphe* conidia were more numerous in the late-sown crop. Wheat crops receiving a nitrogen, phosphorus, and potassium fertilizer produced higher concentrations of all the spores than an unfertilized crop.

Athwal (D. S.). **Gene interaction and the inheritance of resistance to stem rust of Wheat.**—*Indian J. Genet.*, 13, 2, pp. 91–103, 1953. [Received 1955.]

A study was made at the University of Sydney of the mode of inheritance of

resistance to *Puccinia graminis* in the wheat varieties Gabo and Kenya 117 A [*R.A.M.*, 32, p. 672; 34, p. 219]. Two dominant genes in Gabo conferred resistance to race 42, while one gave resistance to races 15, 21, 34, and 40. One major factor in Kenya 117 A with incomplete dominance conferred resistance to races 15, 15c, 21, and 40. The resistance of Kenya 117 A to race 42 was considered due to two dominant or partially dominant genes. The resistance of Gabo was epistatic to that of Kenya 117 A. A method of combining two resistances by use of epistasis is outlined.

Basile (Rita), Leonori-Ossinici (Agnese), & Rosa (M.). **Identificazione di razze fisiologiche di Puccinia triticina Erikss. in Italia. Nota I. Identificazione di razze fisiologiche di Puccinia graminis tritici Erikss. et Henn. in Italia. Nota II.** [The identification of physiologic races of *Puccinia triticina* Erikss. in Italy. Note I. The identification of physiologic races of *Puccinia graminis tritici* Erikss. & Henn. in Italy. Note II.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 21–28, 29–33, 2 figs., 1955. [English summaries.]

In the first paper it is stated that during 1953 the authors, working at the Plant Pathology Station, Rome, in collaboration with five other technical institutes, including the National Institute of Genetics for Cereal Cultivation, Rome, identified eight physiologic races of *Puccinia triticina* in Italy, viz., P.T.R.$_1$, P.T.R.$_2$, 11, 55, 63, 84, 98, and 111 [*R.A.M.*, 33, p. 716]. Of these, races 63, 98, and 111 were new for Italy, and 63 and 111 new for Europe. Race 98 was found twice at Rovigo, on Burgeland and Velino wheat, once at Padua (Montagnana) on the hybrid Miracalo 62, and twice at Rieti (S. Pastore) on W.R. 56 and W.R. 177. It was found twice in association with race 63 and once with race 11.

In the second paper it is stated that 10 races of *P. graminis tritici* [16, p. 89] were identified: 11, 17, 24, and P.G.R. races 1 to 7, inclusive. Race 17 was found at Rovigo (Badia Polesine) on Giuliari wheat, and near Rome on Little Club 1259. Race 11 was collected at Rieti on Koorda (an Australian wheat grown in Cyprus), and race 24 in the same locality on the *ferrugineum* type 1117/1 from Ankara Experimental Station. The seven races designated P.G.R. are probably new for the world. Races 11 and 24 were identified for the first time in Italy.

Johnston (C. O.) & Levine (M. N.). **Physiologic races of the leaf rust of Wheat in the United States in 1954.**—*Plant Dis. Reptr*, 39, 8, pp. 643–646, 1955. [Multilithed.]

In collections of leaf rust of wheat (*Puccinia rubigo-vera tritici*) [*P. triticina*: cf. *R.A.M.*, 34, p. 219; 35, p. 288] received at Manhattan, Kansas, and Saint Paul, Minnesota, from 33 States, 37 races were identified in 1954. Race 5 was again the most prevalent (26·2 per cent. of the 1,143 isolates), followed by races 15 (14·8), 105 and 58 (less than 10), and 35, 54, and 122 (all less than 5), the last three being important because of their virulence on many varieties and their steady increase in recent years. Attention is drawn to the similarity of certain well-known races to each other, and to some that are rare. Those alike may be only variants of the same race.

Hinke (F.). **Bekämpfungsmassnahmen gegen die Berberitze zur Verhütung von Schwarzrostschäden an Getreide.** [Control measures against Barberries for the prevention of black rust damage to cereals.]—*Pflanzenschutz*, 7, 12, pp. 171–174, 11 figs., 1955.

Bavaria is stated to be the only province in the Federal German Republic to sustain more or less heavy damage annually from black rust [*Puccinia graminis*], especially on wheat [cf. *R.A.M.*, 33, p. 715] and rye, representing a financial loss in 1954 of DM. 22,700,000. On 1st August, 1955, an order was promulgated jointly

by the Ministries of Agriculture and the Interior providing for the mechanical or chemical destruction by the owners or occupiers of property of any barberries within a radius of 500 m. of cereal fields [cf. 30, p. 28].

Mechanical methods are practicable only for a few isolated bushes, and even here the operation must be repeated every year because of the luxuriant production of shoots from the roots or stems. Good results are sometimes achieved by a supplementary application to the root system of common salt used for cattle, or kainite (5 to 10 kg. according to the size of the bush), which may also be strewn round the root-collar without preliminary removal of the twigs, but the success of this treatment is largely dependent on soil and weather conditions. In wet seasons the salts are too rapidly leached into the subsoil to produce a satisfactory effect.

Of 18 sprays tested, only three, based on hormones and miscible with diesel oil, have proved serviceable, namely, tormona 100 (Cela, Ingelheim am Rhein), tributon-D (Bayer, Leverkusen), and dikofag-T-oil (Farbwerke Hoechst, Frankfurt-Hoechst). They are applied at a concentration of 3 per cent. to all sides of the basal portions of the bushes (up to a height of 50 to 80 cm. from the ground) and any exposed roots. To ensure permanent results the twigs must be dry, the root-collar free from snow, and the temperature not below 0° C. at the time of treatment. Correctly sprayed bushes in an experimental plot have put out no new growth during a period of $2\frac{3}{4}$ years. Large-scale operations during 1955 demonstrated the economic superiority of this procedure over any others, and it has the further advantages of being applicable during the dormant period and innocuous to adjacent vegetation. The number of bushes treated was 31,343, and the average quantity of spray material used per bush was 0·5 l., costing (inclusive of labour) DM. 0·60.

Săvulescu (T.). **Die physiologischen Rassen von Tilletia foetida (Bauer) Liro und die den Steinbrand hervorrufenden Tilletia-Arten in der Rümanischen Volksrepublik.** [The physiologic races of *Tilletia foetida* (Bauer) Liro and the bunt-inducing *Tilletia* species in the Rumanian People's Republic.]—*Phytopath. Z.*, 25, 3, pp. 267–310, 2 graphs, 1956.

This is a comprehensive, fully tabulated account of laboratory studies and field experiments which furnished much valuable information (already largely covered from other sources) on the species of *Tilletia* responsible for wheat bunt in Rumania [*R.A.M.*, 22, p. 14]. *T. foetida* [C.M.I. map No. 295] is the most widespread, especially in the southern plain. An analysis of 50 samples from all parts of the country showed that it comprises 20 physiologic races. The other species represented are *T. intermedia*, *T. triticoides*, with nine physiologic races, *T. caries* [No. 294] with eight, and *T. nanifica* n.comb. (syn. *T. tritici nanifica* Wagner [*R.A.M.*, 30, p. 31] and *T. brevifaciens* Fischer [*T. controversa*: 31, p. 378; 34, p. 29]).

The minimum, optimum, and maximum temperatures for the germination of *T. intermedia* lay between 2° and 3°, 16° and 20°, and 25° and 28° C., respectively, the corresponding pH values being 4·2, 5·6 to 8, and 9·5 to 10. It produces much the same degree of shortening of the haulms and ears as *T. foetida*. In the Cenad 117 and A. 26 varieties attacked by the latter species the reductions in haulm length did not exceed 26·8 and 24 cm., respectively, while the ears of ICAR 4 were not more than 2·9 cm. shorter than the normal, and those of Odvos and Bankut 201, 2·2. Like *T. foetida*, moreover, *T. intermedia* is transmitted mainly through the seed, though infection by both species is also spread through the soil. Both species flourish on a variety of media, e.g. malt extract agar, soil extract, Leonian's, water agar, sterile water, 0·3 per cent. calcium acetate, wheat seedling agar extract, Winkelmann's soil media (*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, 5, pp. 13–20, 1937), and 0·3 per cent. calcium chloride.

The minimum and optimum temperatures for the germination of *T. triticoides* were the same as for *T. intermedia*, with a slightly lower maximum (24° to 27°);

the pH relations of both species were identical. In general, the former species caused more extensive stunting of the haulms and ears than did *T. foetida* and *T. intermedia*. The dispersal of *T. triticoides* is also effected principally by means of seed-borne chlamydospores, though soil infection also takes place. According to Ulianiṣcev (Microflora Azerbaidjana, 1952), wild rye is a host of the last-named species in Rumania.

Hardison (J. R.), Fenwick (H. S.), & Meiners (J. P.). **Additional grass hosts and a revised host list for dwarf bunt.**—*Plant Dis. Reptr*, 39, 9, pp. 685–687, 1 fig., 1955. [Multilithed.]

This host list of the dwarf bunt fungus, *Tilletia controversa* [cf. *R.A.M.*, 33, p. 726; 35, p. 172, and following abstracts], based on earlier reports and the results of the present studies, includes three additional grasses, namely, *Agropyron desertorum*, *A. sibiricum*, and *Dactylis glomerata*, and several new host records for North America. Geographical distribution and references are given for each host.

Lindquist (J. C.), Sarasola (A. A.), Saraví Cisneros (R.), & Carranza (J. M.). **La caries enana del Trigo (Tilletia controversa) en la Argentina y el Uruguay.** [Dwarf bunt of Wheat (*Tilletia controversa*) in Argentina and Uruguay.]—*Rev. Fac. Agron. Eva Perón*, Ser. 3, 30, 2, pp. 231–243, 1 fig., 1 map, 1954. [English summary.]

In studies at the Institute of Plant Pathology, Eva Perón University, of the incidence of wheat dwarf bunt (*Tilletia controversa*) [C.M.I. map No. 297; cf. *R.A.M.*, 34, p. 29] in Argentina and Uruguay, the fungus was found in three heads among herbarium material collected in Eva Perón province (formerly La Plata) in 1915, its earliest record in America; it was also found in material from various parts of the Argentine cereal region collected from 1937 to 1940, and in a sample of the 1941–2 harvest from Montevideo, Uruguay.

Grasso (V.). **La Tilletia brevifaciens G. W. Fischer in Italia.** [*Tilletia brevifaciens* G. W. Fischer in Italy.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 97–101, 2 figs., 1955.

In 1954 the author received samples of wheat plants from Piacenza, Italy, infected by *Tilletia brevifaciens* [*T. controversa*: cf. next abstract], not previously recorded in Italy [C.M.I. map No. 297]. Investigations into the geographical distribution of the fungus in Italy, as well as into its biology and control, are in progress.

Aebi (H.). **La carie naine du Froment. Aspect actuel du problème en Suisse.** [Dwarf bunt of Wheat. Present position of the problem in Switzerland.]—*Rev. rom. Agric.*, 11, 9, pp. 65–68, 3 figs., 1955.

In experiments on the control of dwarf bunt (*Tilletia brevifaciens*) [*T. controversa*] of wheat in Switzerland [*R.A.M.*, 35, p. 274] two BHC preparations, A and B, each at 15 kg. active material per ha., sprayed on the soil after seeding, reduced the number of infected ears per are from 963 (untreated) to 0·18 and from 1,390 to 0·5, respectively [cf. 34, p. 220]. Applications of PCNB [pentachloronitrobenzene] at the same rate, drilled in with fertilizer, reduced the number from 74 to 0·06.

Hybrids between ten resistant American varieties and the susceptible Swiss MC 245, MC 268, and Probus [34, p. 220] were grown in naturally infested soil which was further contaminated artificially after sowing. The most resistant were hybrids with (27–15) × Rex-Bio, Wasatch, Brevor, Elmar, Hussar, or Hymar as the American parent.

Three races of wheat dwarf bunt have been distinguished in Switzerland: N, the

one generally encountered, W, which attacks the usually resistant Wasatch, and P. which does not cause pronounced dwarfing. In a cross-inoculation experiment with two isolates from wheat, *T. controversa* from *Agropyron intermedium*, and *T. secalis* from rye, each isolate attacked only the host from which it was first obtained [cf. 34, p. 358].

Newburgh (R. W.) & Cheldelin (V. H.). **Effect of antibiotics on the growth of Tilletia caries.**—*Plant Dis. Reptr.* 39, 9, p. 684, 1955. [Multilithed.]

Of the ten antibiotics tested by the Agricultural Research Service, United States Department of Agriculture, and Oregon State College, Corvallis, oligomycin (0·4, 0·5, and 1·5 μg. per ml. medium) alone resulted in a 100 per cent. inhibition of the *in vitro* growth of the wheat bunt fungus, *Tilletia caries* [*R.A.M.*, 34, p. 360].

Hinke (R.). **Zur Frage der Beizung des Getreides mit kombinierten Saatbeizmitteln.** [On the question of cereal treatment with combined seed disinfectants.]—*Pflanzenschutz*, 7, 9, pp. 121–124, 1 fig., 1 graph, 1955.

A tabulated account is given of experiments at the Bavarian Institute for Agriculture and Plant Protection on the control of wheat bunt [*Tilletia caries*: *R.A.M.*, 33, p. 205 and next abstract] and snow mould of rye [*Calonectria nivalis*: see below, p. 443] by seed treatment, prior to storage for up to 24 days, with a combined insecticidal and fungicidal disinfectant based on mercury with lindane, aldrin, or dieldrin at a dosage of 200 gm. per 100 kg.

The mercury-lindane combination did not noticeably impair the germination of Karlshulder summer rye with a low moisture content (15·8 per cent.), but caused a reduction of nearly 50 per cent. after three days' storage in lots with a moisture content of 20 per cent. On the other hand, the mercury-aldrin and -dieldrin combinations were virtually innocuous to seed with a low moisture content and did not cause appreciable reductions in the germination where moisture was 20 per cent.

NOS Nordgau summer wheat reacted much less favourably than rye to the combined method of treatment, lindane being particularly injurious.

It is clear from these results that seed disinfected in the manner described should be sown immediately after treatment. If delay is unavoidable, however, the seed should be spread out in a thin layer until it can be planted.

Schuhmann (G.). **Weitere Beobachtungen über den Einfluss von Umweltbedingungen auf die Wirkung von Beizmitteln bei der Steinbrandbekämpfung.** [Further observations on the influence of environmental conditions on the action of disinfectants in bunt control.]—*Z. PflBau.* 6 (50), 5, pp. 194–204, 6 graphs, 1955.

This paper and those following from the same journal [see following abstracts] were presented at a conference of the 'Working party for disease control and breeding for resistance in cereals and legumes' held at Frankfurt a. M., Germany, on 22nd September, 1955, each being followed by a discussion [cf. *R.A.M.*, 34, p. 356]. The existence of variations already reported [34, p. 359] in the reaction to seed treatment with mercurials of populations of wheat bunt (*Tilletia tritici*) [*T. caries*: see preceding abstract] from different sources was confirmed by further experiments at the Biological Institute, Berlin-Dahlem. It was noteworthy that the mercury-resistant populations in many cases caused a lower incidence of infection in stands from untreated seed than did the susceptible ones, indicating a loss of aggressiveness, possibly through selection [cf. 33, p. 417]. Organic mercurial disinfectants were generally more efficacious at higher temperatures, whereas a chlorinated benzene gave better results at lower ones. In tests to determine the influence of soil constitution on the fungicide (mercurial), the most spores ger-

minated on the surface of treated seed in compost and the least in sand, with intermediate values in mixtures of sand and clay. The toxicity of the mercurials, but not of the chlorinated benzene, was reduced by increasing humidity of the soil, the humidity being more important at the time of sowing than later.

PICHLER (F.). **Versuchsergebnisse mit Zwergbrand und gewöhnlichem Steinbrand.** [Experimental results with dwarf and ordinary bunt.]—*Z. PflBau.* 6 (50). 5, pp. 204–207, 1955.

The results of an experiment in Austria in which plots of Hohenauer Kolben [Club] winter wheat were inoculated first at weekly, later at fortnightly, and finally at monthly intervals between 14th October, 1954, and 23rd March, 1955, by spraying with a suspension of dwarf bunt [*Tilletia controversa*] spores confirmed Böning's observations as to the protracted susceptibility of the host [*R.A.M.*, 34, p. 358 and next abstract]. A trace of infection occurred following the last inoculation, though there was a more or less steady decline after the peak of 21·9 per cent. (20th October), followed by an abrupt fall from 18·9 per cent. (27th October) to 8·8 (3rd November). Seed treatment with mercurials was ineffectual against dwarf bunt in contaminated soil, but the number of diseased ears per 10 sq. m. was reduced from 10 to 1·5 and 2 by two benzene derivatives [cf. preceding abstract]. Complete control, however, was achieved only by dusting the soil with a benzene preparation at a dosage of 50 kg. per ha. or spraying with a 200 per cent. solution at the rate of 600 l. per ha.

To determine the most suitable amount of spore inoculum of wheat bunt [*T. caries*] to use in disinfection experiments, 0·5 per cent. was applied to a semi-resistant and both 0·1 and 0·5 per cent. to a highly susceptible variety. The incidence of infection in untreated plots of the semi-resistant variety was 9·3 per cent. and in those of the highly susceptible inoculated at the low and high rates 11·9 and 46·8 per cent., respectively. Treatment with several disinfectants virtually eliminated infection in the semi-resistant variety and in the very susceptible one inoculated at the lower rate, while even in heavily inoculated plots of the latter the maximum percentage of bunt was 1·8.

BÖNING (K.). **Zur Frage der Nachwinterinfektion durch Zwergbrand.** [On the question of post-winter infection by dwarf bunt.]—*Z. PflBau.* 6 (50). 5, pp. 207–209, 1955.

To gain further information on the factors affecting belated infection by dwarf bunt [*Tilletia controversa*: see preceding abstract] at Munich, Germany, in 1954–5, the soil was inoculated on the same day as wheat seed was sown (12th October) and again on 13th November, 13th December, 19th January, and 31st March. Comparative tests were also performed with bunt [*T. caries*: loc. cit. and next abstract]. The highest incidence of infection by both species (*T. controversa* 23·6, *T. caries* 9·1) developed after the November treatment, while the last trace of the former (0·16 per cent.) was detected in plants from the January inoculation and of the latter (0·1) from that of March.

An analysis of the results of outdoor germination experiments yielded circumstantial evidence that infection by *T. controversa* following the post-November treatments cannot have developed before January and that mass attacks were deferred until the end of February. In all probability most of the infection by *T. caries* also occurred during February and even later. Further confirmation of these findings was provided by an experiment on the control of the pathogens by soil treatment with brassicol-super [*R.A.M.*, 33, p. 530] at the rate of 75 kg. per ha., in which it was estimated that an application as late as 23rd March reduced the amount of infection by about one-half.

Böning (K.). **Zur Frage der Sporenaufwandmenge bei Beizversuchen gegen Weizensteinbrand.** [On the question of the spore dosage in disinfection experiments against Wheat bunt.]—*Z. PflBau*, 6 (50), 5, pp. 209–211, 1955.

A tabulated survey is given of experiments in Germany to compare the relative effects of two spore dosages (2 and 5 gm. per kg. seed) in the inoculation of Mauerner Dickkopf wheat for assays of fungicidal efficiency against 12 collections of bunt [*Tilletia caries*: see preceding abstracts], using two dusts and two liquids, the former at 200 and 300 gm. per 100 kg. and the latter at 0·1 and 0·2 per cent. (30 minutes' immersion). The results demonstrated that the lower dosage was generally quite adequate for the purpose in view, but since the higher rate permitted of sharper differentiation, both between the several fungicides and in respect of variations in the various collections of bunt, its use is to be recommended, more especially in preliminary tests.

Wagner (F.). **Ergebnisse der Zwergbrand-Bekämpfungsversuche 1954/55.** [Results of the dwarf bunt control experiments 1954–55.]—*Z. PflBau*, 6 (50), 5, pp. 212–216, 1955.

The outcome of further experiments in Bavaria on the control of dwarf bunt of wheat [*Tilletia controversa*: *R.A.M.*, 34, p. 357 and next abstracts] confirmed previous findings as to the fungicidal efficiency of soil treatments applied four or even six weeks after sowing. There was no material difference in this respect between the HCB and pentachloronitrobenzene preparations tested. Promising results were also obtained by seed treatment with a mercurial containing a proportion of BHC at a dosage of 800 gm. per 100 kg. [cf. above, p. 433].

Niemann (E.). **Methodik der künstlichen Infektion mit Zwergsteinbrand und Roggensteinbrand.** [Technique of artificial infection with dwarf bunt and Rye bunt.]—*Z. PflBau*, 6 (50), 5, pp. 217–225, 8 graphs, 1955.

A full account is given of experiments at the Kiel-Kitzeberg branch of the German Biological Institute on the inoculation of wheat with *Tilletia controversa* [see preceding abstract], *T. foetida*, and *T. caries* and of rye with *T. secalis* by methods already described [*R.A.M.*, 34, p. 30; 35, p. 362, and next abstract]. The technique proved entirely satisfactory, resulting for instance in 78 per cent. infection by *T. secalis* and 40 to 60 per cent. by *T. controversa*, a quite sufficiently high incidence in both cases for studies on breeding for resistance.

Böning (K.). **Infektion von Roggen mit Zwergbrand des Weizens unter gewöhnlichen Freilandverhältnissen.** [Infection of Rye with dwarf bunt of Wheat under ordinary outdoor conditions.]—*Z. PflBau*, 6 (50), 5, pp. 225–228, 1955.

A remarkable feature of the natural infection of rye by wheat dwarf bunt [*Tilletia controversa*] reported from Bavaria [*R.A.M.*, 35, p. 173 and preceding abstracts] was the number of partially infected ears, the healthy grains being poorly developed. The haulms were uniformly stunted, with a minimum height of 28 cm. Similar observations were made by v. Minckwitz in Swabia, where the heights of bunted plants ranged from 17·5 to 75 cm. compared with 122 to 138 for normal ones. The phenomenon of partial infection is tentatively attributed to a resistance reaction, either of rye in general or of the Petkus variety, which is widely grown in south Germany.

Cenoz (H. P.). **Resistencia al carbón volador del Trigo.** [Resistance to loose smut of Wheat.]—*Rev. Invest. agríc., B. Aires*, 6, 1, pp. 29–87, 1952. [Received February, 1956.]

Inoculation experiments have been conducted in Argentina since 1944 to deter-

mine the reaction of wheat of all the indigenous and introduced varieties of *Triticum aestivum* to loose smut (*Ustilago tritici*) [*R.A.M.*, 29, p. 352; 34, p. 290] and to discover reliable sources of resistance. Of all the Argentine varieties only Sinvalocho M.A. was completely resistant; 38 M.A., Reliance sel. Klein, Klein Cometa (D.I.V. 201), Buck Quequén, Klein Aniversario, Klein Exito, Klein Orgullo, Klein Otto Wulff, and Klein Progreso were almost immune or highly resistant, and Klein 157, Guatraché M.A., Kanhard sel., Buck, Klein Amalia Klein, and Massaux No. 3 resistant. Of the introduced varieties Apex, Axminster, Carina, Chino 466, Chul, Dixon, Fultz, Giza 121, Heines Kolben, Kendee, María Escobar, Newthatch, Rapier, Redhart Strain 5, and Riosulino were classed as immune, and many others as highly resistant.

T. durum was immune or highly resistant, while *T. monococcum*, *T. dicoccum*, *T. polonicum*, *T. macha*, and *T. timopheevi* were only slightly affected.

A comparison of results obtained in Argentina and in the United States suggests that the physiologic races present in each country are distinct and that the race used in these experiments is of low pathogenicity.

Niemann (E.). **Über die Wirkung verschiedener Saatgutaufbereitungs-Verfahren auf den Gersten- und Weizenflugbrandbefall.** [On the effect of different methods of grading seed on infection by Barley and Wheat loose smut.]—*Z. PflBau*, 6 (50), pp. 228–235, 3 graphs, 1955.

None of the four methods of grading and selecting seed samples proposed by various workers for the control of barley and wheat loose smuts (*Ustilago nuda* and *U. tritici*) [cf. next abstract], involving separation by size, specific weight, single seed weight, and wind-sifting, resulted in a consistent reduction of infection in experiments at the Kiel-Kitzeberg branch of the German Biological Institute.

Shevchenko (F. P.). Массовой внутрисортовой отбор яровой Пшеницы на устойчивость к пыльной головне. [Mass selection within varieties of spring Wheat for resistance to loose smut.]—Земледелие [*Zemledelie, Moscow*], 3, 8, pp. 73–76, 1955.

Experiments in the U.S.S.R. from 1947 to 1953, inclusive, showed that a successive selection of spring wheat seed for large size, high specific gravity, and high rate of germination results in increased resistance to loose smut [*Ustilago tritici*: *R.A.M.*, 35, p. 94; cf. preceding abstract], bunt [*Tilletia caries*: 35, p. 93], brown and yellow rusts [*Puccinia triticina* and *P. glumarum*: 34, p. 777], and [unspecified] root rot and in increased productivity. Better and poorer seed fractions from the 1947 yield resulted, respectively, in 3·18 and 3·8 per cent. smut in 1948 and 0·4 and 0·93 per cent. in 1951 for Milturum 321. The corresponding figures for Milturum BR-13 were 2·5 and 3·24 (1948) and 0·4 and 2·5 (1951); Caesium 111 1·27 and 14·78 (1948) and 9·28 and 12·05 (1951); and for Smena 8·34 and 31·1 (1948) and 5·24 and 7·84 (1951). In 1952 (selection year) infection by *U. tritici* was 0·57 per cent. in the crop from which the initial material was taken, 0·09 per cent. for the large seed fraction, and none for highly germinating seeds. The corresponding figures for 1953 were 3·5, 1·62, and 1·21 per cent., the weights per 1,000 grains being 25, 28·7, and 30·9 gm., respectively. Pre-winter sowing also increases resistance to *U. tritici* for several generations. Similarly, increased resistance is obtained by keeping germinated seeds at low temperatures. Sowing dates are important. When the widely used varieties Milturum 553 and Milturum 321 were sown early they were highly resistant to *U. tritici*, while disease incidence increased in late-sown seeds, the resistance of such lines being reduced in a series of seed generations.

Batts (C. C. V.). **Observations on the infection of Wheat by loose smut (Ustilago tritici (Pers.) Rostr.).**—*Trans. Brit. mycol. Soc.*, 38, 4, pp. 465–475, 4 pl., 3 figs., 1955.

This information has already been noticed from a shorter version [*R.A.M.*, 34, p. 361].

Popp (W.). **A comparative study of spore germination of Ustilago tritici and U. nuda.**—*Phytopathology*, 45, 11, pp. 585–590, 2 figs., 1 diag., 1955.

At the Plant Pathology Laboratory, Winnipeg, Canada, observations were made on spore germination of physiologic races R1, R2, R3, R4, and 50–8 of *Ustilago tritici*, and R1, R2, 49–70, 49–68, 47–14, and 51–20 of *U. nuda*, the agents of wheat and barley loose smut, respectively. On potato dextrose agar the chlamydospores of *U. tritici* produce relatively long promycelia, individual cells of which develop into branched hyphae of uninucleate cells. Through continuous budding the cells of the branches acquire a resemblance to conidia but remain attached to each other, later conjugating in pairs to initiate the dikaryotic phase. On the same medium the promycelia of *U. nuda* are only about half as long as those of *U. tritici*. The compatible cells conjugate in pairs and give rise to binucleate hyphal branches, each of which subdivides usually into one bi- and two uninucleate cells. The former branch and the latter conjugate and subdivide as before. Thus the growth phases in *U. nuda* are alternately di- and monokaryotic. The germination of both species followed a similar course on water agar, except for a slight tendency of some promycelial cells of *U. tritici* to bud and divide before fusion.

U. tritici and *U. nuda* have often been regarded as identical in all respects except host specialization [*R.A.M.*, 8, p. 297; 33, p. 116, *et passim*], but the fundamental differences in type of spore germination disclosed by the present studies provide a morphological basis for their retention as distinct species.

Bockmann (H.). **Vorfruchtwirkung und Schwarzbeinigkeit beim Weizen.** [Effect of the preceding crop and black leg of Wheat.]—*Z. PflKrankh.*, 62, 8–9, pp. 533–539, 1955.

In further investigations in 1953–4 at the Kiel-Kitzeberg (Schleswig-Holstein) branch of the German Biological Institute to determine the effects of various rotational sequences on the incidence of *Ophiobolus graminis* in wheat [*R.A.M.*, 33, p. 14], wheat as usual was the most unsuitable forerunner, followed by barley. In one experiment the wheat yields following legumes, crucifers, flax, sugar beet, and potato, and after fallow were over 50 per cent. higher. The maximum increase of over 100 per cent. was obtained in plots following sugar beet and the next highest after swedes and fallow (both more than 70 per cent.). The results of other trials demonstrated the beneficial influence of appropriate precursors in reducing the losses from take-all even in stands on inoculated soil.

Golubchuk (M.), Sorger-Domenigg (H.), Cuendet (L. S.), Christensen (C. M.), & Geddes (W. F.). **Grain storage studies. XIX. Influence of mold infestation and temperature on the deterioration of Wheat during storage at approximately 12 per cent. moisture.**—*Cereal Chem.*, 33, 1, pp. 45–52, 1956.

At the Minnesota Agricultural Experiment Station [*R.A.M.*, 34, p. 587; 35, p. 175 and next abstract] surface-disinfected samples of Redman hard red spring wheat, inoculated with a mixed suspension of *Aspergillus glaucus*, *A. flavus*, *A. ochraceus*, *A. candidus*, and *Penicillium* sp., were held at 18 per cent. humidity for seven days at room temperature prior to storage at approximately 12 per cent. and 24° and 38° C.

After the pre-storage treatment the mould count of 31,000 per gm. in the inoculated samples was well within the range of that encountered in many lots of

wheat going into commercial storage. Mould invasion increased the losses in viability and rises in fat acidity during temporary storage at 18 per cent. humidity. On subsequent storage at 12 per cent. humidity the mould counts of most of the samples declined, but fat acidity continued to increase at both temperatures. Although no significant increase in germ damage was perceptible in the samples stored at 24° and in the surface-disinfected ones at 38°, the incidence rose sharply in the inoculated samples stored at the latter temperature, thereby clearly demonstrating that a combination of high temperature and mould infection causes more severe injury from this source than either factor alone.

Sorger-Domenigg (H.), Cuendet (L. S.), & Geddes (W. F.). **Grain storage studies. XX. Relation between viability, fat acidity, germ damage, fluorescence value, and formazan value of commercial Wheat samples.**—*Cereal Chem.*, 32, 6, pp. 499–506, 7 graphs, 1955.

In further studies in the current series [see preceding abstract] 68 commercial samples of hard red spring and winter wheats containing from 3 to 60 per cent. germ-damaged grains and ranging from 1 to 95 per cent. in viability were analysed for fat acidity, the extent of browning as measured by the fluorescence, and for dehydrogenase activity (formazan value). Germ damage was found to be positively correlated with fat acidity ($r = 0{\cdot}46$) and fluorescence value of aqueous extracts ($r = 0{\cdot}47$), and negatively with viability ($r = 0{\cdot}49$) and formazan value ($r = 0{\cdot}69$).

Sill (W. H.). **A winter Rye useful in identifying soil-borne Wheat mosaic virus.**—*Phytopathology*, 45, 11, p. 637, 1955.

In Johnson County, Kansas, in 1953, winter rye plants of the (?) Balbo variety showing severe green mosaic symptoms even after the onset of hot weather were found growing in soil infested by wheat mosaic virus [*R.A.M.*, 32, p. 673]. Seed from these plants was sown during the next years in virus-infested soils from both Kansas and Illinois at the Kansas Agricultural Experiment Station, where the plants developed conspicuous green mosaic symptoms, irrespective of length of day, at average winter greenhouse temperatures of or exceeding 70° F. after the long incubation periods of 69 days and upwards from sowing date reported by McKinney as typical of the disease on rye (*Circ. U.S. Dep. Agric.* 442, 1937).

Sill (W. H.) & Agusiobo (P. C.). **Host range studies of the Wheat streak mosaic virus.**—*Plant Dis. Reptr*, 39, 8, pp. 633–642, 2 figs., 1955. [Multilithed.]

In studies on the host range of the yellow strain of wheat streak mosaic virus [*R.A.M.*, 34, p. 713; 35, p. 175, and next abstract] at the Department of Botany and Plant Pathology, Kansas State College, Manhattan, various plants were tested. Wheat and certain millets (*Panicum miliaceum*, *Setaria italica*, and *Echinochloa crus-galli*) alone were susceptible enough to be damaged severely by the disease; oats, rye, and barley were infected systemically without appreciable damage. Many varieties of maize were immune, but some, together with certain varieties of teosinte (*Euchlaena mexicana*) were systemically infected in varying degree. Some were symptomless, in others symptoms disappeared with age. *Sorghum vulgare*, Sudan grass, *S. almum*, *S. versicolor*, *Coix lacryma-jobi*, Johnson grass (*S. halepense*), *Panicum maximum*, orchard grass (*Dactylis glomerata*), sugar-cane, three pearl millet (*Pennisetum glaucum*) varieties, and 14 other grasses, all the monocotyledons other than grasses (32 species in 13 families), and all the dicotyledons tested (five species in four families) were immune.

Swarup (V.). **A cytogenetical analysis of reactions to Wheat streak-mosaic virus in certain Agropyron-Triticum hybrids.**—*Diss. Abstr.*, 15, 10, pp. 1706–1707, 1955.

The results of studies at Kansas State College suggested that the genes for resis-

tance (local lesion (LL) reaction) to wheat streak mosaic virus [see preceding abstract] in certain late-generation hybrids of wheat × *Agropyron elongatum* (immune) crossed with Pawnee wheat [cf. *R.A.M.*, 33, p. 22] are probably located on certain univalent chromosomes of *Agropyron*, some of which are short and some long, of either the genom X or Y or both. The LL reaction is obtained only when all the chromosomes carrying resistance genes are present. Since a few grass-like characters also appear to be associated with the LL reaction it would probably be difficult to obtain a wheat line having none of these characters but retaining still the factor for mosaic resistance.

Bruehl (G. W.) & Toko (H.). **A Washington strain of the cereal yellow dwarf virus.**—*Plant Dis. Reptr*, 39, 7, pp. 547–549, 1 fig., 1955. [Multilithed.]

In pot experiments at the Department of Plant Pathology, Washington State Experiment Station, Pullman, a strain of the cereal yellow dwarf virus [*R.A.M.*, 33, p. 74] isolated from an unidentified grass and transmitted by *Rhopalosiphum fitchii* failed to cause severe stunting of Baart 46 wheat and Atlas 46 barley in the seedling stage. Rojo barley and Kanota oats were both susceptible. These reactions distinguish the Washington strain from that described in California [loc. cit.]. On other cereal varieties the symptoms caused by the two strains were similar.

Vendrig (J. G.). **De levenscyclus van Helminthosporium sativum P.K., en B. op Tarwe en Gerst.** [The life-cycle of *Helminthosporium sativum* P.K., & B. on Wheat and Barley.]—Abs. in *Tijdschr. PlZiekt.*, 62, 1, p. 30, 1956.

At the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, Holland, in 1955 the host-cycle of *Helminthosporium sativum* [*Cochliobolus sativus*] was investigated, using three isolates from wheat and five from barley (seed and foliar lesions in each host). Primarily infected seedlings developed from inoculated seed or seed sown in inoculated soil. The initial symptoms appear on the coleoptile, which rapidly turns brown under the influence of the internal mycelium. The first true leaves are then attacked, the first spots appearing at the tips, while secondary infections on the upper leaves arise from conidia produced in the primary lesions. All parts of the plant (including the flowers) which have passed the meristematic stage are susceptible. Stunting is a frequent consequence of severe leaf infection.

Many seeds failed to develop following inoculation at flowering time, and susceptibility continued until 20 days thereafter (80 to 90 per cent. seed infection). The germinability of infected seeds was greatly reduced, and invasion of the coleoptiles was prevalent among the seedlings that did develop.

In general, the isolates from barley attacked their own host more readily than wheat, whereas those from wheat were pathogenic to both. Barley was more susceptible than wheat to most of the isolates.

Viennot-Bourgin (G.). **Une nouvelle espèce de rouille de l'Orge en Iran.** [A new species of rust on Barley in Iran.]—*C.R. Acad. Sci., Paris*, 242, 3, pp. 410–412, 1956.

Uromyces iranensis n.sp., found on cultivated barley in Persia, is characterized [without a Latin diagnosis] by sparse development of the uredo stage and abundant teleutosori. The spherical or ellipsoid uredospores measure 17 to 30 by 15 [to ? 24] (average 23·8 by 19·5) μ, and the spherical, pyriform, or ovoid (or alternatively angular) teleutospores 17·5 to 26·5 by 12·5 to 23 (21·1 by 17) μ, with a non-persistent pedicel.

Puccinia glumarum and *P. graminis* were also observed on barley, but *P. hordei* could not be identified with certainty.

Shands (R. G.). **Inheritance of covered smut resistance in two Barley crosses.**—*Agron. J.*, 48, 2, pp. 81–86, 1 graph, 1956.

The inheritance of resistance to race 6 of *Ustilago hordei* [*R.A.M.*, 26, p. 448] in Wisconsin was conditioned by one dominant major factor pair in the barley crosses Chevron × Brachytic and Colsess IV × Brachytic. Resistance was independent of five plant characters. Hybrid progenies showed a distinct relationship between smut reaction and the characters normal and brachytic, plants of normal height giving more classifiable plants in the smut test. Averages of classifiable plants in Chevron × Brachytic F_3 progenies within resistant, segregating, and susceptible smut classes were 78, 72·4, and 62·4 per cent., respectively; F_3 progenies of Colsess × Brachytic acted similarly. There were highly significant differences in the percentage of classifiable plants of F_3 progenies in Chevron × Brachytic as related to the three classes of resistance versus susceptibility to stem rust [*Puccinia graminis*].

Porter (R. H.). **Longevity of Ustilago nuda in Barley seed.**—*Phytopathology*, 45, 11, pp. 637–638, 1955.

At the Colorado Agricultural Experiment Station barley seed of the Coast I variety, harvested in 1942, was sown in 1953 and gave rise to several heads infected by loose smut (*Ustilago nuda*). The low relative atmospheric humidity and moderate summer temperatures in the vicinity of Fort Collins afford ideal conditions for the longevity of seed and very likely also for that of certain seed-borne fungi carried internally. Judged by the reports of Stakman (*Tech. Bull. Minn. agric. Exp. Sta.* 133, 1913) and Dickson and Johann (*in litt.*) of the brief longevity of *U. nuda* spores, the mycelium in the scutellum [*R.A.M.*, 34, p. 361] provides a much more favourable condition for the survival of the pathogen.

Sill (W. H.) & Hansing (E. D.). **Some studies on Barley stripe mosaic (false stripe) and its distribution in Kansas.**—*Plant Dis. Reptr*, 39, 9, pp. 670–672, 1 map, 1955. [Multilithed.]

Observations by the Department of Botany and Plant Pathology, Kansas State College, Manhattan, during a wheat streak mosaic survey [*R.A.M.*, 35, p. 175] showed two strains of barley stripe mosaic virus (false stripe) [33, p. 532 and following abstracts] to occur on winter barley in Kansas. One did not infect oats but gave symptoms on barley, wheat, and maize. The other infected oats, gave symptoms on maize, and was severe on wheat and barley, causing in addition to stripe mosaic stunting on both and longitudinal leaf-rolling in wheat. The fact that some diseased plants tend to remain symptomless hampers the estimation of the percentage infection in seed samples tested.

Eslick (R. F.) & Afanasiev (M. M.). **Influence of time of infection with Barley stripe mosaic on symptoms, plant yield, and seed infection of Barley.**—*Plant Dis. Reptr*, 39, 10, pp. 722–724, 1955. [Multilithed.]

In nursery trials at Bozeman, Montana, reduction in barley yield was most marked when plants were inoculated with barley stripe mosaic virus [*R.A.M.*, 35, p. 363 and preceding and next abstracts] one to three weeks before heading. Seed-borne infection was greatest when inoculations were made ten days before heading. The results further indicate that Titan was less susceptible to inoculation than Campana, whether measured by plant yield or the appearance of seed-borne stripe mosaic, that roguing of diseased head rows at the two- to three-leaf stage would be practical, since inoculations at that period resulted in low seed-borne infection, and that field inspection for stripe mosaic at about heading time would give a reasonable estimate of the amount of the disease present and possibly a better index of the amount to expect in the seed than earlier or later readings.

Timian (R. G.) & Sisler (W. W.). **Prevalence, sources of resistance, and inheritance of resistance to Barley stripe mosaic (false stripe).**—*Plant Dis. Reptr*, 39, 7, pp. 550–552, 1955. [Multilithed.]

Barley false stripe virus [*R.A.M.*, 34, p. 631 and preceding abstracts] is present in most States in the Upper Mississippi Valley. In North Dakota 93 per cent. of the 214 barley fields examined in 1954 were infected and a trace to 15 per cent. infection was found in 47 per cent. of the 115 seed samples collected. The virus can cause severe yield reduction; in row trials this averaged 17 per cent. in Manchuria (C.I. 2330) and 24 per cent. in Mars with, respectively, 62 and 22 per cent. initial infection of the seed. Modjo (C.I. 3212) and C.I. nos. 3212–1, 4219, and 5020 developed no symptoms in a field trial and resistance to the California 'E' strain was transmitted in crosses of these with susceptible varieties.

Lapalme (A.). **Nature de la résistance de l'Avoine à la rouille de la tige.** [The nature of the resistance of Oats to stem rust.]—*Rev. Oka*, 28, 5, pp. 138–154, 1954.

The author briefly reviews the present state of knowledge concerning resistance in oats to stem rust (*Puccinia graminis*), with 51 references to the literature. The first part of the paper includes sections on the factors involved in resistance and on physiological races of the rust. The second deals with prevention and control. Varieties recommended for Quebec are listed.

Grasso (V.). **Studio sulla genetica dei carboni dell'Avena : Ustilago avenae e U. levis.** [A study on the genetics of the Oat smuts: *Ustilago avenae* and *U. levis*.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 115–126, 1955. [English summary.]

An account of these studies at the University of Minnesota and the College of Agriculture, Pullman, Washington, on the oat smuts *Ustilago avenae* and *U. levis* [*U. kolleri*], has been noticed from another source [*R.A.M.*, 35, p. 178].

Leukel (R. W.). **Control of loose smut in Oats and bunt in Wheat with commercial fungicides, 1954–55.**—*Plant Dis. Reptr*, 39, 8, pp. 647–649, 1955. [Multilithed.]

During the 1954–5 season 14 fungicides (standard and experimental mercurials) were tested by the Plant Industry Research Station, Beltsville, Maryland [cf. *R.A.M.*, 34, p. 360], for the control of heavy natural infection of loose smut (*Ustilago avenae*) on Fultex oats and, together with five non-mercurials, bunt [*Tilletia* sp.] on Purplestraw wheat. Ceresan M ($\frac{1}{2}$ oz. per bush.), ceresan M 2 × ($\frac{1}{4}$), both as slurries, panogen ($\frac{3}{4}$), panogen 42 ($\frac{3}{8}$), and PA–2N (4), all as liquids, completely eliminated loose smut, while liquid 244 ($\frac{1}{2}$), liquid 365 ($\frac{3}{4}$), MEMA ($\frac{3}{4}$), and YF 3576 solution ($\frac{1}{8}$), all liquids, allowed less than 5 per cent. smutted panicles, as against an average of 57 per cent. from untreated seed.

Wheat bunt was completely eliminated by puraseed ($\frac{1}{2}$) and ceresan M slurries and liquid 244, liquid 365, panogen, panogen 42, setrete ($\frac{3}{4}$), MEMA and YF 3576, all liquids. Agrox ($\frac{1}{2}$), mergamma (2), ceresan M 2 ×, and anticarie ($\frac{1}{2}$) slurries, and merculine ($\frac{3}{4}$), vancide (4), and PA–2N liquids resulted in less than 1 per cent. bunted heads, compared with an average of 83·5 per cent. from the untreated seed.

Rosen (H. R.). **Variation in pathogenicity in the Helminthosporium blight organism of Oats and evidence of its relationship to H. sativum.**—*Plant Dis. Reptr, Suppl.* 228, pp. 114–115, 1954. [Multilithed.]

In view of the evidence indicating that *Helminthosporium* blight of oats (*H. victoriae*) [*R.A.M.*, 34, p. 637; 35, p. 363] is not confined to Victoria derivatives (*Mem. Cornell agric. Exp. Sta.* 315, p. 16, 1953) and the fact that spore measurements of conidia, colour of spores, and polar germination of such spores all indicate kinship to *H. sativum*, the author has reduced the name *H. victoriae* to a varietal status *H. s.* var. *victoriae* (*Bull. Ark. agric. Exp. Sta.* 533, p. 22, 1953). In addition

the finding of a single perithecium on Traveler straw at the University Farm, Fayetteville, Arkansas, in 1947 morphologically resembling *Ophiobolus* [*Cochliobolus*] *sativus*, the perfect state of *H. sativum* [cf. 35, p. 288], and containing the coiled ascospores which readily break into short segments, very distinctive of *C. sativus*, further supports the view that the oat blight is related to *H. sativum*.

Ostazeski (S. A.) & Bever (W. M.). **The microflora of stored and field-collected Oats.**—*Plant Dis. Reptr*, 39, 7, pp. 591–596, 4 figs., 1955. [Multilithed.]

At the Illinois Agricultural Experiment Station and the Field Crops Research Branch, United States Department of Agriculture, the examination of oat spikelets from plants in various stages of development showed that mycelia were present in the pericarp only when the plants neared maturity [cf. *R.A.M.*, 31, p. 177]; glume infections appeared consistently after the emergence of the panicle from the flag leaf. *Alternaria* sp. was the commonest isolate. In stored samples *Aspergillus* sp. was the only fungus that made visible growth over the grain, the minimum moisture requirement being above 13 per cent. and the optimum temperature 30° to 35° C.

Hadden (S. J.) & Harrison (H. E.). **Occurrence of Oat mosaic in the lower coastal plain of South Carolina.**—*Plant Dis. Reptr*, 39, 8, pp. 628–632, 1955. [Multilithed.]

Oat mosaic virus [*R.A.M.*, 32, p. 618] was severe in 1952–3, and even more so in 1954–5, in an autumn-sown oat nursery in Beaufort County near the Atlantic coast, lower South Carolina. Of the 29 named varieties and 48 unnamed selections included in the nursery, a third are regarded as too susceptible for safe growing on infested soil, and of the 77 entries in this nursery only two selections (C.I. 6913 and C.I. 7011) with adequate resistance to both crown and stem rusts [*Puccinia coronata* and *P. graminis*] are rated as even moderately resistant to the mosaic. Most of the basic breeding lines with rust resistance factors are susceptible to mosaic, which, when severe, is one of the most destructive diseases of oats. Observations indicate that the reaction to mosaic is inherited independently of that to rusts and smuts [*Ustilago* spp.]. None of the wheat varieties and selections grown in the same nursery was affected.

Kirchner (H. A.). **Schützt eine sofortige Trockenbeizung extrem feucht geerntetes Saatgetreide vor Verderb?** [Does an immediate dusting protect cereal seed harvested in an extremely damp condition against spoilage?]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 9, 6, pp. 113–114, 1955.

At the Rostock (Mecklenburg) branch of the German Biological Institute, the application of germisan dust (200 gm. per 100 kg.) to rye seed with a moisture content of 20·1 per cent. in November, 1954, failed to confer protection from spoilage by [unspecified] moulds and mites in storage during the next four months.

Wagner (F.). **Versuche zur Bekämpfung des Schneeschimmels (Fusarium nivale Ces.) bei Winterroggeni m Höhenlagen mit Stäube- und Spritzmitteln im Spätherbst. Vorläufige Mitteilung.** [Experiments on the control of the snow mould (*Fusarium nivale* Ces.) on winter Rye in upland areas with dusts and sprays in the late autumn. Preliminary note.]—*Z. PflKrankh.*, 62, 8–9, pp. 539–544, 2 figs., 1955.

At high altitudes with a long persisting snow-cover in Bavaria the treatment of rye seed with mercurial fungicides fails to prevent winter-killing by *Fusarium nivale* [*Calonectria nivalis*: see above, p. 434]. In recent experiments, however, the incidence of infection was reduced from 50 to 0 per cent. by soil disinfection with a dust containing pentachloronitrobenzene and with brassicol-super, both at the rate of 100 kg. per ha.; the latter was also tested at 50 and 75 kg. with promising

results. The treatments were applied between 2nd November and 16th December, 1954, when the seed had already emerged but before the formation of the snow-cover, which persisted for 83 days. Used as a spray at the rate of 30 kg. per ha., brassicol-super was equally effective, completely eliminating infection over an area where the snow-cover persisted continuously for three months. On the untreated plots the incidence of snow mould was 63 per cent.

Ullstrup (A. J.). **Variations within species of Helminthosporium.**—*Plant Dis. Reptr, Suppl.* 228, pp. 116–117, 1954. [Multilithed.]

Variation in cultural behaviour and virulence in *Helminthosporium turcicum* [*R.A.M.*, 29, p. 20], *H. maydis* [*Cochliobolus heterostrophus*], and *H. carbonum* [29, p. 361; 34, p. 90] is discussed with reference to the literature [see next abstract]. In the author's experience maize seedlings usually showed uniform susceptibility to *H. turcicum* [cf. 29, p. 361]; resistance was expressed only when plants were several weeks old; and there was no specialization in parasitism among isolates of this species from maize. The longer isolates have been in pure culture and the more frequently they have been transferred, the greater has been the variation in cultural behaviour and virulence. Of the three fungi, *C. heterostrophus* is the most variable in cultural characters [11, p. 393]. *H. carbonum* appears to have two races, one highly and the other mildly virulent [23, p. 293].

Ullstrup (A. J.). **Helminthosporium diseases on Corn.**—*Plant Dis. Reptr, Suppl.* 228, pp. 118–119, 1954. [Multilithed.]

In this review of the *Helminthosporium* diseases of maize in the United States [see preceding and next abstracts] *H. turcicum*, *Cochliobolus heterostrophus*, and *H. carbonum* are stated to be of economic importance. The fungi, disease symptoms, distribution, and varietal reactions are briefly described. *H. rostratum* and *H. sativum* [*C. sativus*] are of minor importance.

Stoner (W. N.), Conover (R. A.), Walter (J. M.), Darby (J. F.), Swank (G.), & Stevenson (F. V.). **Control of two Helminthosporium leaf blights of Sweet Corn in peninsular Florida.**—*Circ. Fla agric. Exp. Sta.* S–69, 7 pp., 1 col. fig., 1954. [Received January, 1956.]

Notes are given on the symptoms and control of *Helminthosporium turcicum* and *H. maydis* [*Cochliobolus heterostrophus*], the most destructive maize diseases in peninsular Florida [*R.A.M.*, 34, p. 582 and preceding abstracts], and on the conditions favouring their development. Spray experiments at the Florida Agricultural Experiment Station and the experience of growers have demonstrated effective control by timely applications of 2 qt. nabam plus $\frac{3}{4}$ lb. zinc sulphate containing 36 per cent. zinc or the equivalent, or 2 lb. zineb, each in 100 gals. water. The breeding of resistant varieties is in progress [34, p. 146].

Hoppe (P.). **How well is Sweet Corn seed-treated with fungicides by commercial seed companies?**—*Agron. J.*, 48, 2, pp. 90–91, 1 fig., 1956.

Samples of maize seed supposedly well-treated by eight commercial seed companies [*R.A.M.*, 34, p. 293] were obtained from Wisconsin Canners and subjected to the standard warm room and cold test germinations [see following abstracts] by the rolled towel technique in the Plant Pathology Department, University of Wisconsin. In 1954 germinations exceeded 90 per cent. in the standard laboratory test and after retreatment with arasan dust, but four lots fell below this figure in the cold test, two averaging only 69 and 75 per cent., respectively. The two companies at fault were then notified of these results and in 1955 their samples and those of three of the other companies showed nearly perfect seed treatment.

HOOKER (A. L.). **Intra-inbred line variation in resistance to a Pythium seedling disease of Corn.**—*Agron. J.*, 47, 12, pp. 580–582, 1955.

This study from the Departments of Plant Pathology and Agronomy, University of Wisconsin, was made to determine the range of variability among individual ears and ear selections within the dent maize inbred strains A 375, M 14, W 16, W 23, and W 28 with respect to their resistance to *Pythium debaryanum* [*R.A.M.*, 35, p. 364] and *P. ultimum* [33, p. 667]. Progenies were grown in the field from 1948 to 1951. Uninjured, hand-shelled seed, seed having the pericarp injured by shaking in a roughened container, and treated, uninjured seed dusted with thiram was sown in soil known to be infested with the above-named pathogens, which was moistened to approximately 60 per cent. water holding capacity and kept for 14 days at a temperature of 11° C. The pans of soil were then moved to a warm room, the whole procedure being referred to as the cold soil test.

Significant differences in disease resistance index values found among individual ears were still inexplicable after a laboratory germination test and a determination of the seed-borne organisms present. To ascertain whether part of this variation was heritable, ears of low, intermediate, and high disease index values in each strain were selected for progeny testing. Significant differences were evident among the progeny grown from selected ears within each inbred strain, the means of these progeny being associated with the reaction of their parent ears. Sub-lines differing in their reaction in the cold soil test were isolated by selection. Differences in reaction found among individual ears within these sub-lines were shown by progeny tests to be non-inheritable. There was a strong tendency for the differences in sub-lines to be maintained in populations grown from them.

HOOKER (A. L.). **Additional seed factors affecting stands of Corn in cold soils.**—*Agron. J.*, 47, 12, pp. 582–585, 1955.

This paper, a joint contribution from the University of Wisconsin and Iowa State College, is concerned with the effects of seasonal conditions of temperature and moisture, date of planting, soil nitrogen level, and plant population on the predisposition of maize seed to infection by *Pythium debaryanum* and other [unspecified] soil fungi at low temperatures. This was investigated by sowing progenies of three inbred lines of maize (A 375, M 14, and W 23) in successive seasons (1949 to 1951) and subjecting the seed to the cold soil test [see preceding abstracts]. Seed produced in 1949 at warm temperatures and with ample soil moisture during June, July, and August, followed by a generally cool but dry September and October, gave better stands than that produced in 1951 under generally cool, dry conditions or in 1950 under cool, wet conditions. Seed from delayed sowings consistently produced poorer stands in cold *Pythium*-infested soil than that from the early plantings. The effects of delayed sowing and harvesting are therefore similar and may be important in inheritance studies as are differences between pollen and seed parents grown under different conditions. No measurable differences in resistance to *P. debaryanum* at 10° C. were detected among seed lots of the same genotype produced at three levels of soil nitrogen (0, 100, and 200 lb. per acre) or three levels of plant population (12,000, 16,000, and 20,000 plants per acre).

GORTER (G. J. M. A.). **Prevention of Maize diseases.**—*Fmg in S. Afr.*, 30, 355, pp. 424–429, 15 figs., 1955.

The author describes the symptoms, transmission, and control of factors favouring attack by, and varietal reaction to the principal diseases of maize in South Africa, grouped under leaf diseases, ear rots, smuts, stalk rots, and non-parasitic disorders. Bacterial leaf blight [? *Xanthomonas vasculorum* f. *zeae*: cf. *R.A.M.*, 31, p. 536], occurring to a small extent in some western Highveld areas, is characterized by sharply delimited lesions ranging from small yellow spots to long, pale

green or necrotic stripes with a narrow yellow margin. When the stripes are very broad the tissue between may die. Affected leaves are easily torn by the wind. At present there is no satisfactory control method, but as the disease may be insect-transmitted its spread may be checked by roguing the plants first affected.

Swarup (G.). **Fungi associated with Sorghum seed in Kansas.**—*Diss. Abstr.*, 15, 10, pp. 1710–1711, 1955.

From 1951 to 1954 an investigation was made of the microflora of seed samples from six varieties of sorghum [*R.A.M.*, 29, p. 556; 33, p. 79], representing different areas of Kansas and obtained from the Kansas State Seed Laboratory. Of the total of 8,702 isolates obtained 8,479 were identified to species and 172 to genus only, while another 30 were classified as possible smuts and yeasts, and 21 were unidentified; 15 samples showed no infection. *Alternaria tenuis* accounted for 7,302 isolates; the rest were divided among 33 genera and 62 species. The next largest groups in order of frequency of isolation were *Chaetomium*, *Fusarium*, *Helminthosporium*, *Curvularia*, *Thielavia*, and *Aspergillus*. Of the total isolates, 5,902 were obtained in 1954, 857 in 1951, 1,117 in 1952, and 826 in 1953; 5,398 were from grain sorghums and 3,304 from forage varieties. The number of isolations from each variety was Westland 2,112; Martin, 1,913; Midland 1,373; Sumac 1,320; Atlas 1,133; and Ellis 851. The central region of the State yielded 3,627 isolates, the western part 2,512, and the eastern 2,563; 7,026 isolations were made from viable seeds and 1,676 from non-viable. Higher fungus incidence was correlated with poor seed colour.

Calavan (E. C.), DeWolfe (T. A.), Weathers (L. G.), Klotz (L. J.), & Christiansen (D. W.). **Control treatments for brown rot of Citrus fruits.**—*Calif. Citrogr.*, 41, 1, p. 2, 1955.

A number of spray formulations are given that may be used against brown rot (*Phytophthora* spp.) of citrus, which can be controlled in California [*R.A.M.*, 34, p. 782] by a single well-timed copper-containing spray. They are made up with powdered copper sulphate (pentahydrate) and hydrated spray lime and applied at 250 to 300 lb. per sq. in.: (1) Bordeaux mixture, 3–4½–100; (2) zinc-copper-lime, 3 (zinc sulphate, monohydrate)-2–6–100; (3) any suitable proprietary copper fungicide applied as recommended and containing 0·6 to 0·8 lb. metallic copper per 100 gals. The second formulation, though causing some copper damage to foliage, is useful where this injury tends to be severe. An alternative spray, not phytotoxic, is captan 50-W, 2 lb. to 100 gals., repeated after ten weeks. Oil sprays in conjunction with any of the above may lessen their effectiveness. Trials have shown that Bordeaux 3–4½–100 is slightly better than 3–3–100 and apparently less injurious than 1–1–100; the addition of a spreader tends to increase spray damage.

Weathers (L. G.), Calavan (E. C.), Wallace (J. M.), & Christiansen (D. W.). **A bud-union and rootstock disorder of Troyer Citrange with Eureka Lemon tops.**—*Plant Dis. Reptr*, 39, 9, pp. 665–669, 3 figs., 1955. [Multilithed.]

Most of this information on bud-union and rootstock disorder of Troyer citrange with Eureka lemon tops has already been noticed from another source [*R.A.M.*, 35, p. 179]. Only Eureka is affected, and not Lisbon lemon strains or orange on Troyer citrange stock. Before the appearance of the symptoms, two or more years after planting, trees are usually very vigorous and appear healthy. There may be incompatibility between Eureka lemon and Troyer rootstock, but it is not direct, since rootstock lesions also occur where Valencia sweet orange interstock is used, this variety being compatible with both. It is suggested that Eureka lemon carries a virus seriously affecting Troyer citrange, and as nucellar lines of Eureka react similarly to old-line Eureka, such a virus must be seed-transmissible or readily transmitted mechanically or by a vector.

Costa (A. S.), Grant (T. J.), & Moreira (S.). **Behavior of various Citrus root-stock-scion combinations following inoculation with mild and severe strains of tristeza virus.**—*Proc. Fla hort. Soc.*, 67 (*1954*), pp. 26–30, 2 figs., 1 diag., 1955.

In 1950 an experiment was started in Brazil to study the ability of mild strains of citrus tristeza virus [*R.A.M.*, 35, p. 293] to confer protection against subsequent invasion by severe strains, and to determine the effect of the mild strains on the behaviour of scions budded on tristeza-tolerant rootstocks. Five varieties of sweet orange, three of grapefruit, two of lime, and one of tangerine were used as scions on sweet orange and sour orange rootstocks and inoculated separately with eight sources of mild strains and one source of a severe strain by inserting an infected bud below the scion.

Three years after budding the growth made by the four types of scion on non-tolerant sour orange root-stock was very poor after inoculation with the severe strain, though less severely affected by the mild strains. On tristeza-tolerant sweet orange rootstocks the growth of sweet orange and tangerine tops was equally good whether they were infected with the mild or severe strains. Grapefruit and lime tops infected with the mild strains made slightly better growth than those with the severe strain, but the difference was less marked than on sour orange.

The symptoms shown by naturally infected plants tended to be of the severe type, indicating that severe strains were present in the natural tristeza virus complex in the area.

Jamoussi (B.). **Les maladies de dépérissement des Agrumes.** [The wilt diseases of Citrus.]—*Rev. Mycol.*, 20, *Suppl. colon.* 1, pp. 1–47, 1955.

A succinct account, based on the literature (71 references), is given of the chief wilt diseases of citrus, their causes, geographical distribution, plants affected, manner of spread, symptoms, and control. The first section (pp. 1–18) deals with virus diseases, and comprises quick decline or tristeza, the psoroses, and 'stubborn' disease. The second section (pp. 19–33), on fungal diseases, covers gummosis (*Phytophthora citrophthora*, *P. parasitica*, *P. syringae*, *P. hibernalis*, and *P. palmivora*) and root rots (*Armillaria mellea*, *Clitocybe tabescens*, *Sclerotinia sclerotiorum*, *Rosellinia pepo*, *R. bunodes*, dry root-rot associated with *Fusarium* spp., and Texas root-rot due to *Phymatotrichum omnivorum*). The final section (pp. 33–47) is concerned with physiological wilts, i.e. mal secco, considered by Pasinetti to be due to adverse soil factors [*R.A.M.*, 33, p. 669], but by other workers to *Deuterophoma tracheiphila* [33, p. 670], and 'salant', caused by excess of salt in the irrigation water, soil, or underground water. Each section has its own bibliography.

Moreau (C.) & Moreau (Mireille). **Le dépérissement des Agrumes en Côte d'Ivoire.** [The wilting of Citrus in the Ivory Coast.] —*Rev. Mycol.*, 19, *Suppl. colon.* 2, pp. 55–57, 1 pl. (facing p. 92), 1954.

During the past five years citrus trees planted between the huts in native villages or on the edge of the forest in the French Ivory Coast have died off as a result of foot rot due primarily to *Phytophthora palmivora* [see preceding abstract]. Mandarins are affected first, then oranges and lemons. As citrus trees are also planted round cacao plantations locally, it would appear that the unhealthy condition of some of the latter in relation to citrus wilt merits further investigation.

Moreau (C.). **Le problème de la protection des Agrumes dans les transports et en entrepôts.** [The problem of the protection of Citrus during transit and in warehouses.]—*Fruits d'outre mer*, 9, 2, pp. 51–59, 9 figs., 1954.

The author describes and illustrates the damage sustained by citrus fruits in transit and storage in France due chiefly to *Penicillium italicum* and *P. digitatum* [*R.A.M.*, 34, p. 642], *Phomopsis* [*Diaporthe*] *citri* [34, p. 92], *Phytophthora parasitica*,

Alternaria citri [32, p. 622], *Oospora citri-aurantii* [35, p. 294], and *Diplodia natalensis* [33, p. 349], giving the microscopic characters of the fungi and the conditions favouring their development. He suggests means of avoiding these conditions during cultivation, handling, and storage and describes the methods of testing fungicides employed by other workers in this field. In his own experiment oranges were kept in ordinary storage at 11° [C.], a drying room at 7° to 8°, and a refrigerated store at 3° to 4°. After two months in the drying room unwrapped fruit was 7 to 10 per cent. rotten, that wrapped in plain paper 7 to 8 per cent., and fruit in wraps impregnated with a 2 per cent. solution of the quaternary ammonium salt cequartyl BE only 0·5 to 4 per cent. After three months in the refrigerated store the corresponding figures were 13·3, 9, and 5 to 8 per cent.

KUYKENDALL (J. R.). **Survey of iron deficiency in Florida Citrus.**—*Proc. Fla hort. Soc.*, 67 (*1954*), pp. 33–38, 1 map, 1955.

A survey made to determine the iron content of citrus leaves [*R.A.M.*, 35, p. 293] from groves throughout Florida showed that the mean content for all varieties in all areas was 66·6 p.p.m. Of the 123 groves concerned, 50 had a leaf iron content below 60 p.p.m.; 64 groves on rough lemon rootstocks (all varieties, all regions) had a mean content of 70 p.p.m., while that of 45 groves on sour orange was 61 p.p.m. Groves of Pineapple and Temple oranges and Dancy tangerines had 59, 44, and 62 p.p.m., respectively. Low values were generally recorded in the Indian River, Upper East Coast, and Brooksville districts.

MARTYN (E. B.). **The Coconut disease in the Keta area of the Gold Coast (Cape Saint Paul wilt). A report.**—24 pp., 1 map, Gold Coast Department of Agriculture, 1954. [Mimeographed.]

The writer describes the symptoms and habit of the Cape Saint Paul wilt of coco-nuts in the Gold Coast and of like wilts of this palm observed in southern Nigeria [*R.A.M.*, 35, p. 13], French Togoland, and other neighbouring parts of West Africa, and concludes that all are similar to coco-nut bronze leaf wilt [cf. 35, p. 181] and should therefore be referred to by that name. An account is given of a series of observations and experiments on the disease at Keta, Gold Coast, which further refutes a pathogenic origin for it. This, together with the environmental conditions under which the disease occurs in Nigeria, indicates that it is not attributable to an inimical soil environment but rather that the cause may be in the nutrient uptake of the plant. The need is stressed for investigation of diseases of this nature with planned research over a long period by an institution where the necessary facilities, and more especially continuity, can be secured.

Third Annual Report of the West African Institute for Oil Palm Research, 1954–1955.—152 pp., 2 col. maps, 1955.

In the Plant Pathology section (pp. 122–132) of this report [cf. *R.A.M.*, 35, p. 366] details are given of experiments indicating the infectious nature of blast disease of oil palms. The disease becomes evident at the end of the wet season, when the soil is still moist, and increases in severity during the early part of the dry season; 13·3 per cent. of 1,120 seedlings surveyed at the Institute during the year and 12·3 of those at the Nigerian sub-station were affected. It seems likely that a *Rhizoctonia*-like fungus isolated from dead stelar tissue is only a secondary parasite. In one experiment blast disease was transmitted by placing macerated diseased tissue adjacent to healthy primary roots. In another blast-affected seedlings with typical cortical root rot were lifted and grown in nutrient solution; the rot passed up infected roots and affected apparently healthy primary roots, further indicating the pathogenic nature of the disease.

In the main nursery of the Institute losses due to anthracnose [loc. cit.] totalled

7 per cent. Three types of anthracnose have been distinguished: in A a fungus (either *Colletotrichum* or *Gloeosporium*) forms sporing bodies within dark brown lesions surrounded by pale brown and yellow haloes; in B acervuli are produced with spores differently shaped from A in similar lesions, but the centres dry out more rapidly, giving larger, grey areas; in C dark brown lesions surrounded by a pale yellow halo are developed in areas between the main veins, which restrict them. The causal fungus of the C has been isolated, but not yet induced to sporulate. All three anthracnoses were significantly reduced by spraying with perenox (both at 5 per cent. and 15 per cent. copper), or Bordeaux mixture (10–10–100), best applied while the seedlings were at the pre-nursery stage.

The causal agent of freckle has now been identified as *Cercospora elaeidis* [34, p. 720]. Shade did not affect the development of this disease. Good control was achieved by copper fungicides (Bordeaux, Burgundy, carbide Bordeaux, and perenox), but the reduction in freckle was offset by severe copper leaf scorching, to which oil palm seedlings are abnormally sensitive. The best results were obtained with low strength perenox (0·05 per cent. copper), which gave only 64 per cent. freckle control but caused less copper burn.

In plots affected by orange frond disease [35, p. 367] no increase in bunch number or weight has occurred following applications of magnesium sulphate. An experiment on nursery seedlings showed that applications of nitrogen, phosphorus, and potassium can all induce magnesium deficiency, the effect being cumulative if they are applied together. Bunch refuse at 50 tons per acre was more effective than magnesium sulphate at 1 oz. per seedling in combating the deficiency, the symptoms of which were also suppressed by shade. In view of the importance of mineral disorders and minor element deficiencies in the oil palm and other crops a special research unit for plant nutrition is to be established at the Institute.

Wallace (G. B.) & Wallace (Maud M.). **The bark diseases of Coffee.**—*E. Afr. agric. J.*, 21, 1, pp. 25–27, 1955.

Of the two bark diseases of coffee present in East Africa, that termed 'bark disease' [*R.A.M.*, 34, p. 351] is caused by *Fusarium lateritium* var. *longum* [11, p. 712], of which two strains, A1 and A2, exist. The second disease, now termed 'scaly bark', discovered in 1936 [18, p. 519], was later ascertained to be due to *F. stilboides*. It is becoming increasingly widespread and destructive on Mt Kilimanjaro, as well as in the Usambara and Uluguru mountains. Pruning wounds are believed to provide an important means of entry. 'Scaly bark' is not usually fatal.

The evidence obtained from inoculation experiments and growth in culture indicates that strain A1 of *F. lateritium* var. *longum* is identical with *F. stilboides*. Both A1 and A2 can cause bark disease, but only strain A1 can cause scaly bark.

W. L. Gordon [cf. 31, p. 597] agrees with the view of Snyder and Hanson that *F. stilboides* and *F. lateritium* var. *longum* are synonyms of *F. lateritium* [25, p. 366]. No perithecia of the perfect state, *Gibberella baccata*, were observed. A brief note is given on the growth by the authors of *F. lateritium* strain A1.

At present there seem to be better prospects of controlling scaly bark than bark disease. When the former is prevalent, there appears to be an advantage in growing coffee on the multiple-stem system. Wounds made in pruning and stumping should be protected. To control bark disease cutting back should be done in at least two stages, to encourage the development of slow-growing, sturdy shoots. When either disease is present all prunings should be burned.

Meiffren (M.). **La trachéomycose du Caféier en Côte d'Ivoire.** [Tracheomycosis of the Coffee bush in the Ivory Coast.]—*Phytiatrie-Phytopharm.*, 4, 3, pp. 131–135, 1955.

Most of the information in this general account of *Gibberella xylarioides* on coffee

in the Ivory Coast has already been noticed [*R.A.M.*, 35, pp. 182, 183]. Inoculation experiments in which young plants, surface sterilized and wounded on the roots and collar, were dipped in a suspension of the fungus, confirmed field observations on the extreme susceptibility of *Coffea canephora* from the Ivory Coast and French Guinea, and of Indénié coffee. The reaction of grafted coffee was shown to depend on the stock.

Mora (H. B.). **Control of Omphalia leaf spot of Coffee in Costa Rica with puratized agricultural spray.**—*Plant Dis. Reptr*, 39, 7, p. 582, 1955. [Multilithed.]

With inadequate control measures, leaf spot of coffee (*Omphalia flavida*) [*Mycena citricolor*: *R.A.M.*, 34, p. 225] can be very severe in plantations near Buena Vista, Costa Rica. The crop is grown without shade at a rather close spacing of 8 by 9 ft., and disease spread is favoured by the climatic conditions, the mean annual rainfall over a period of 11 years being 123 in. (134 in 1954) with an average of 278 (315) rain days per year. In laboratory and field tests puratized agricultural spray (3 pints per 100 gals. water) gave promising control. The absence of the phosphorescence caused by the fungus from infected plants after spraying indicated that the fungicide was absorbed by the leaves, killing the mycelium. The infection bodies of the imperfect state [31, p. 15], however, were not killed, probably because of their protective mucilaginous covering.

Smith (A. L.), Andrews (O. N.), & Wear (J. I.). **Distribution of crinkle leaf of Cotton in Alabama and adjoining States.**—*Plant Dis. Reptr*, 39, 10, pp. 773–775, 1 fig., 1 map, 1955. [Multilithed.]

Crinkle leaf of cotton, due to manganese toxicity [*R.A.M.*, 32, p. 556], was reported as occurring for the first time in Alabama in 1954 in Pickens county but records indicate that the disorder was present in Lauderdale county in 1940 and had also been observed in Limestone county.

Wilhelm (S.), Raabe (R. D.), & Smalley (E. B.). **Some previously unrecorded hosts of Verticillium albo-atrum in California.**—*Plant Dis. Reptr*, 39, 9, pp. 693–694, 1955. [Multilithed.]

Included among the new hosts of *Verticillium albo-atrum* recorded in California since the publication of the previous report [*R.A.M.*, 29, p. 448] are *Vigna sesquipedalis*, *Tetragonia expansa*, *Acer palmatum*, and rhubarb.

Staffeldt (E. E.) & Fryxell (P. A.). **A measurement of disease reaction of Cotton to Verticillium wilt.**—*Plant Dis. Reptr*, 39, 9, pp. 690–692, 1955. [Multilithed.]

Studies at the New Mexico College of Agriculture and Mechanic Arts showed that simply to reckon the percentage of cotton plants infected by wilt (*Verticillium albo-atrum*) [*R.A.M.*, 33, p. 721] was not adequate to determine tolerance of the disease under local conditions. A grading system was therefore devised, based on the percentage of functioning photosynthetic area and the external symptoms. Grading ranged from 0 (plants with 100 per cent. of the photosynthetic area functioning and appearing healthy, without external symptoms) to 4 (dead or almost defoliated plants with only 0 to 9 per cent. functioning photosynthetic area). A subsequent refinement was to grade also for the degree of stunting due to the disease.

Tipler (R. V.). **Some experiments on the control of Cotton blackarm disease (Xanthomonas malvacearum E.F.S. (Dowson)) by chemical seed treatment.**—*C.R.* (*III*e) *Congr. int. Phytopharm., Paris, 1952*, 2, pp. 655–663 [? 1953. Received 1955.]

This information on the control of *Xanthomonas malvacearum* on cotton in

Uganda, a co-operative investigation between the Department of Agriculture, Uganda, and Imperial Chemical Industries Ltd., has already been noticed from other sources [*R.A.M.*, 32, p. 375; 35, p. 367, *et passim*].

MacLeod (D. M.). **Notes on the genus Empusa Cohn.**—*Canad. J. Bot.*, 34. 1, pp. 16–26, 3 pl., 1 map, 1956.

A number of *Empusa* species were isolated from insects sent to the Laboratory of Insect Pathology, Sault Ste Marie, Ontario, or collected by the Forest Insect Survey of the Division of Forest Biology. Altogether 44 species of insects from 20 families were infected. The author prefers to follow Thaxter and incorporate all species under *Empusa*. *E.* [*Entomophthora*] *sphaerosperma* [cf. *R.A.M.*, 7, p. 321] and forms of the *Empusa grylli* type [14, p. 580] were the most commonly isolated sporing species. Other species found included *E. bullata*, *Entomophthora aphidis*, *Empusa erupta* [5, p. 95], and *E. muscae*.

Examples are given of species parasitizing harmful insects, but beneficial ones are sometimes attacked as well.

Peach (Mary) & Juniper (A. J.). **Stylopage araea Drechsler var. magna var. nov.**—*Trans. Brit. mycol. Soc.*, 38, 4, pp. 431–434, 2 figs., 1955.

A description is given of *Stylopage araea* var. *magna* n.var. which differs from the species [cf. *R.A.M.*, 18, p. 798] in having larger conidia (12·5 to 37·5 by 5·5 to 12 μ). It was isolated from cow dung in Essex and from soil in Nottingham and captures amoebae [cf. 32, p. 313].

György (K.). **Distribution of the more important Flax diseases in Hungary, in 1954.**—*Agrártud. egy., 1955*, 4, pp. 159–162, 1955. [Abs. in *Hung. agric. Rev.*, 4. 4, p. 11, 1955.]

Colletotrichum lini [*C. linicola*: *R.A.M.*, 33, p. 721], *Polyspora lini* [loc. cit.], and *Septoria linicola* [cf. 30, p. 507] are stated to be the three most important diseases of flax, particularly flax seedlings, in Hungary, the first named being the most serious. Dusting seed with germisan gives only partial control. Successful trials are in progress using N-trichloromethyl-mercaptophthalimide [captan] and also garlic sap. Complete control, however, will only be obtained by breeding resistant varieties.

Culbertson (J. O.) & Kommedahl (T.). **The effect of seed coat colour upon agronomic and chemical characters and seed injury in Flax.**—*Agron. J.*, 48, 1, pp. 25–28, 1956.

In experiments at the Univeristy of Minnesota, St. Paul, with isogenic lines selected from two crosses between brown- and yellow-seeded flax varieties, more seeds of the brown-seeded lines were free from internal micro-organisms when plated on both potato-dextrose and malt-salt (2 per cent. malt, 5 per cent. sodium chloride) agars. Many seeds were infected with *Alternaria* spp., the brown-seeded lines to a significantly higher degree. The abundance of *Colletotrichum linicola* and *Fusarium* spp., however, was not associated with seed coat colour, *C. linicola* appearing more frequently in brown-seeded lines on potato-dextrose agar and in yellow-seeded lines on malt-salt.

Girolami (G.). **Comparative anatomical effects of the curly-top and aster-yellows viruses on the Flax plant.**—*Bot. Gaz.*, 116, 4, pp. 305–322, 25 figs., 1955. [Received April, 1956.]

At the University of Hawaii, Honolulu, the author studied the effects on the flax variety Punjab of two phloem-limited viruses, beet curly top and aster yellows. These produced fundamentally similar degenerative changes in the phloem of the vegetative shoots, characterized by hypertrophy of the cells surrounding the first-

differentiated sieve tubes, followed by the hyperplastic production of abnormal sieve tubes. These subsequently broke down, producing lacunae which were filled by proliferation from adjacent tissue. Abnormal phloem elements were also produced in the xylem and in the fundamental tissue surrounding the vascular bundles.

There were slight differences between the infections, which might be of diagnostic value: with curly top the breakdown of the abnormal sieve elements produced lacunae of various sizes, but with aster yellows the obliteration of these elements was more diffuse, and large lacunae were never formed.

In these experiments the flax plants were grown in gallon cans in a greenhouse. They were inoculated at the 18-leaf stage by allowing infected leaf hoppers (*Circulifer tenellus* [*Eutettix tenella*] for curly top and *Macrosteles fascifrons* for aster yellows) to feed on them for 72 hours.

VAN DER SPEK (J.). **Kiemplantinfectie door Botrytis bij Vlas.** [Seedling infection by *Botrytis* in Flax.]—Abs. in *Tijdschr. PlZiekt.*, 62, 1, pp. 28–29, 1956.

The results of investigations at the Phytopathological Laboratory of the Agricultural College, Wageningen, Holland, showed that flax seed is the undoubted source of the primary infection of seedlings by *Botrytis* [? *cinerea*: *R.A.M.*, 31, p. 593]. Untreated seed may be infected by the scanty mycelium arising from seed coats left in the ground, resulting in the typical symptom of local constriction of the hypocotyl, which may be discoloured but often merely presents a glassy aspect. Sporulation soon follows and accelerates the progress of the pathogen, the diseased plant frequently collapsing on the ground and producing superficial mycelium which may infect plants on either side. This mode of infection accounts for the prevalence of the fungus in densely planted stands. After the disappearance of a short row of seedlings there is no further advance of infection. Since the pathogen operates on and very slightly below the soil surface, the extent of its occurrence is determined largely by soil factors, especially the moisture content of the uppermost layer.

Annual Report of the Jute Agricultural Research Institute (1954–55).—138 pp., 1955.

Chapter VII (pp. 54–61) of this report [cf. *R.A.M.*, 34, p. 523] contains information on jute diseases in Bengal, India. Under the conditions prevailing at Nilganj for the last three years early-sown crops, both of *Corchorus capsularis* and *C. olitorius*, were more susceptible than the late-sown to root and stem rot (*Macrophomina phaseoli*). Pycnidiospores were able to germinate and attack the leaf tissue within three to four hours in a favourable environment, infection spreading immediately after a shower at a steady temperature of 85° F. These and other observations indicate that sprays, e.g., of Bordeaux mixture, colloidal copper, and copper oxide, would be useful before and after rain.

All the eight forms of the pathogen under investigation [loc. cit.] grew more rapidly in darkness than in diffused light. All developed faster at 35° than at 23° C. on potato dextrose agar. B 45 appears to be a slow-growing saprophyte. Sclerotia were produced earlier in B 61, B 68, and B 46 than in the other forms; those of B 68 were greenish-grey by reflected light on potato-dextrose agar. The sclerotia of B 45 and B 43 were very late in appearing: in the former they were smaller, less compact, and of irregular shape as compared with the other strains.

In pathogenicity tests on seedlings of JRO 632 (*C. olitorius*), B 43 was the most virulent of the eight forms, followed by B 46 and B 50, while B 45 and B 35 were the slowest in their action. In a plot in which jute and potatoes were grown for the third consecutive year, mortality due to the eight forms of *M. phaseoli* ranged from 27 to 66 per cent. Epiphytotics of root rot in jute-potato fields are attributable in

the first nstance to this pathogen, *Fusarium* (?) *solani* being of secondary importance.

A comparative study of *Colletotrichum capsici* isolated from jute in Malaya (B 63) [loc. cit.], the same species from *Capsicum frutescens* at Coimbatore, and the *C.* sp. [loc. cit.] from jute in the Nilganj district of Bengal (B 55) revealed morphological and physiological differences. The failure of B 63 and B 55 to attack chilli (*Capsicum annuum*) and their divergences from the type culture (B 74) supplied by the Indian Agricultural Research Institute, New Delhi, indicate that the two former are not identical but may be different strains of separate species, B 63 having smaller conidia than B 55 and agreeing closely with *Colletotrichum corchorum*, described from Japan [20, p. 465]. The indigenous types and varieties of *Corchorus capsularis* are much less susceptible to anthracnose than those of Japanese and Chinese origin grown at the Institute.

Chlorosis developed after about 40 days in six out of 50 plants inoculated with smears of crude sap extract from chlorotic leaves. The transmission of the disorder through the seed has already been reported: selections from chlorotic types are now giving rise to uniformly chlorotic progenies having stunted growth, low seed production, and heavy seedling mortality.

With a view to the control of *M. phaseoli* and *Colletotrichum* sp. by breeding, 59 selections were made from improved types of *Corchorus capsularis* and 10 from the more susceptible *C. olitorius*. In a varietal test the incidence of infection by *M. phaseoli* ranged from 3·8 per cent. in the JRC–918 selection of *C. capsularis* to 58·1 in JRC–1, while all the improved strains of *C. olitorius* contracted 5 to 6 per cent. root rot. Trials with commercial fungicides against secondary leaf infection by *M. phaseoli* indicated that Bordeaux mixture, cuprous oxide, and colloidal copper were effective in the field.

Chapter X (pp. 70–85), dealing with various aspects of the cultivation of substitute fibres, comprises brief notes on diseases. In addition to those already recorded [34, p. 524], mention may be made of severe wilt [? *F. udum* var. *crotalariae*] of *Crotalaria* [*juncea*: 30, p. 165].

Hoarer (A. E.). **Mosaic disease will cut Abaca production.**—*Fibre Cord. World Industr.*, 35, 432, pp. 17, 19, 1955.

The serious position now existing in the Philippine abaca [*Musa textilis*] industry due to the ravages of abaca mosaic virus [? strain of cucumber mosaic virus: *R.A.M.*, 34, p. 723] prompted this useful account of the symptoms, modes of infection and transmission, and possibilities of control of the disease. This necessitates the services of an efficient, fully trained inspection force; compulsory destruction of diseased plants, weeds, and other hosts of the virus in every plot and plantation; compensation to the growers and financial assistance in replanting with certified stock and insecticidal treatment against the vectors; and broadening the research programme to discover immune varieties.

Although mosaic was alleged to be under control in 1952 [33, p. 482], in 1953 it was reported rampant in Mindanao and elsewhere, and with a 30 per cent. increase in the area planted production fell by 6 per cent. To-day the disease is regarded as a threat to the industry, and the chairman of the Manila Hemp Association stated recently in London that the fall in production in 1954 could apparently be attributed only to the mosaic virus.

Summers (T. E.) & Pate (J. B.). **Influence of temperature on the susceptibility of Kenaf to Colletotrichum hibisci Poll.**—*Plant Dis. Reptr*, 39, 8, pp. 650–651, 1 fig., 1955. [Multilithed.]

In greenhouse pot experiments at the Everglades Experiment Station, Belle Glade, Florida, there was a marked difference in the reaction of nine lines of kenaf

(*Hibiscus cannabinus*) to inoculation with race 2 of *Colletotrichum hibisci* [*R.A.M.*, 34, p. 228 and next abstract]. Some lines were completely susceptible at 20°, 25°, and 30° C., whereas others were completely susceptible at 20°, affected but not killed at 25°, and highly resistant at 30°. In culture the fungus grew more rapidly at 25° than at 20°.

Pate (J. B.) & Summers (T. E.). **Reaction of Kenaf introductions and selections to races of Colletotrichum hibisci.**—*Plant Dis. Reptr*, 39, 10, pp. 776–778, 1955. [Multilithed.]

In conjoint studies by the Field Crops Research Branch, United States Department of Agriculture, and the Everglades Experiment Station, Belle Glade, Florida, carried out in July and October, 1954, kenaf [*Hibiscus cannabinus*] varieties reacted differently to races 1 and 2 of *Colletotrichum hibisci* [*R.A.M.*, 33, p. 354 and preceding abstract]. Javanese, Manchurian, and Peruvian varieties were susceptible to both the races. Selection was carried out in the Salvadorian variety, some plants of which were resistant to both races. Certain lines reacted differently to the two races, and some were resistant in summer, but less so with lower temperatures in the autumn. An F_4 Salvadorian × Javanese line and two first generation selfed lines from an Egyptian introduction showed the greatest resistance after the autumn inoculations.

Naito (N.) & Toshikazu (T.). **Cercospora leaf spot of Kenaf caused by Cercospora hibisci Tracy et Earle.**—*Tech. Bull. Kagawaken agric. Coll.*, 4, 3, pp. 187–192, 1953. [Japanese, with English summary. Abs. in *Biol. Abstr.*, 29, 5, p. 1225, 1955.]

In Kagawa prefecture, Japan, *Cercospora* leaf spot of *Hibiscus cannabinus* appears from mid-July to the end of October, affected leaves drying up and dropping at an early stage. The fungus also attacks *H. syriacus*. Conidia formed in pure culture only immediately after isolation. The optimum temperature for growth was about 25° C. The spores germinated well at 25° to 30°, but failed to do so at 35°. Germination occurred throughout the range pH 4·2 to 8·2. Inoculation of *H. cannabinus* leaves with mycelium produced on potato decoction agar gave positive results, the incubation period in September being only three to four days. The fungus was referred to *C. hibisci-cannabini* by Sawada [*Descr. Catal. Formosan Fungi* 2, p. 153, 1922], but no difference could be found between it and *C. hibisci* [cf. *R.A.M.*, 28, p. 378; 34, p. 524].

Scholten (Miss G.). **Meeldauw bij bloemisterijgewassen.** [Mildew in floricultural crops.]—*Meded. Dir. Tuinb.*, 18, 8–9, pp. 681–691, 4 figs., 1955. [English summary.]

Most of the information in the ten papers consulted by the author in her survey of the importance of mildew in ornamentals has already been noticed in this *Review*, but mention may be made of observations in the Aalsmeer district, Holland, where particularly heavy losses are caused by *Oidium begoniae* on begonias and *Sphaerotheca pannosa* on roses.

Magie (R. O.) & Cowperthwaite (W. G.). **Commercial Gladiolus production in Florida.**—*Bull. Fla agric. Exp. Sta.* 535, 67 pp., 36 figs., 1954. [Received 1956.]

This bulletin covers all aspects of commercial gladiolus cultivation in Florida. Much of the information on mineral deficiencies (pp. 15–20) has been noticed already in this *Review* [*R.A.M.*, 31, p. 490], and also the greater part of that on diseases and their control [loc. cit.; 34, p. 787, *et passim*], which are dealt with under headings of leaves and flowers (pp. 34–46), corms (pp. 47–55), neck rots (pp. 56–57), and miscellaneous diseases and injuries (pp. 57–63). Control measures against the most destructive diseases are summarized (pp. 63–65).

Dry neck rot, caused by an unidentified *Fusarium* sp., commonly occurs in autumn following wet weather. Beacon, Snow Princess, and Early Dawn are highly susceptible and Picardy appears to be highly resistant. Young plants are attacked near ground level and as new leaves grow through those already diseased infection spreads upward and inward. Control lies in avoiding injury to the plants, promoting drying of the soil surface, and giving weekly applications of nabam and zinc sulphate as the plants emerge. Wet neck rot, caused by *Pellicularia* [*Sclerotium*] *rolfsii* attacks mature plants in hot weather. Although the necks are susceptible, the corms are often resistant and therefore the plants should not be rogued. *Curvularia* neck rot [*C. lunata*] commonly occurs in soil where a previous crop has been severely attacked by the leaf-spotting phase of the disease [31, p. 490]. Planting stock and young corms should not be set out on such land again for up to three years.

The miscellaneous disorders include bud rot, a physiological breakdown chiefly affecting the lower buds on the larger spikes of Picardy, Spotlight, and Valeria, and caused partly by low pH or low calcium supply and poor soil aeration. The petal edges are discoloured and watersoaked before the floret opens. Fat bud also affects the lower florets, involving an inward curling of the petal tips and proliferation of petal tissue, making the bud swell. Spotlight is particularly susceptible. The condition usually occurs in plantings with good nutrition and near-optimum water relations. Yellow banding is caused by rapid leaf growth when the nights are relatively cool and the sunlight brilliant. Sun injury during early growth, causing bud sheath burn, may reduce the market value of the spikes.

Grasso (V.). **Il mosaic del Gladiolo in Italia.** [Mosaic of Gladiolus in Italy.]—*Ann. Sper. agr.*, N.S., 9, 2, pp. 437–442, 3 pl., 1955. [English summary.]

Gladiolus plants growing near Pistoia, Italy, were stunted before flowering and had a somewhat abnormal habit. Rectangular discoloured areas characteristic of mosaic [virus: *R.A.M.*, 35, p. 186] were scattered irregularly over the leaf surface. On some plants the discolorations formed stripes running along the veins from the apex to the middle of the leaf or beyond it, and broken here and there by specks of normal green. The stripes tended to coalesce, forming a yellowish area spotted with green. In a more advanced stage the discoloured areas appeared dry and pale or reddish-brown. The new corms were spotted, with under-developed roots.

Similarly affected plants were seen near Pescia and Florence; in Soffiano the plants also had colourless flowers bearing violaceous, round or elongated spots, some of the flowers being completely atrophied. It is concluded that the condition was due to an as yet unidentified virus.

Domsch (K. H.). **Beitrag zur Methodik der Keimfähigkeitsprüfung an Samen von Zierpflanzen unter Berücksichtigung samenübertragbarer Krankheiten.** [Contribution to the technique of testing seeds of ornamentals for germinability in relation to seed-transmissible diseases.]—*Gartenbauwissenschaft*, 2 (20), 1, pp. 109–113, 3 graphs, 1955.

In experiments at the Kiel-Kitzeberg (Schleswig-Holstein) branch of the German Biological Institute, fairly large samples were found to be essential for the reliable assay of germinability of aster seed infected by *Botrytis cinerea* (300 seeds in the Jacobsen germinating apparatus and 500 in soil composed of five parts of loam, three of peat, and one of sand).

Since the proportion of diseased seedlings in the apparatus is dependent on the temperature and duration of the germination process, germinability must be evaluated according to a definite plan. For instance, at 12°, 16°, and 20° C. the percentages of healthy seedlings were 65, 62, and 48, respectively. In a test conducted at a uniform temperature of 16° the maximum number of healthy seedlings

was recorded on the fifth day after the inception of germination, after which a gradual decline set in and eventually all contracted infection. An important factor affecting germinability is the distance between the seeds, close sowing promoting the spread of the fungus. Thus, at distances of 7·5, 10, and 15 mm. apart the percentages of healthy seedlings were 31, 35, and 44, respectively.

The soil tests required a longer period of observation than those in the germinator, the maximum number of healthy seedlings (51 per cent.) being counted on the 11th day from the onset of germination. In soil, however, the diseased seedlings fail to emerge at all, and the results obtained by this method are adjudged to be more dependable than those given by the germinator.

ROBISON (R. S.). **Control of bacterial wilt of Chrysanthemum with streptomycin.** —*Diss. Abstr.*, 15, 10, p. 1701, 1955.

In experiments at Rutgers University [New Jersey] the application of 10 p.p.m. streptomycin to the rooting sand resulted in the survival and rooting of 50 per cent. of chrysanthemum cuttings inoculated with the bacterial wilt organism (*Erwinia chrysanthemi*) [*R.A.M.*, 35, p. 189]. The frequency and intensity of vascular evidence of the disease decreased in cuttings rooted in sand treated with increasing concentrations of the antibiotic until at 50 p.p.m. there was almost complete survival with no evidence of phytotoxicity. In sand 100 p.p.m. controlled an established infection, 93 per cent. of the initially infected cuttings surviving. Spread was reduced by applying 25 p.p.m. to the sand. Control was also secured by adding 1 per cent. streptomycin by weight to a rooting hormone powder and by immersing the cuttings for 10 minutes in a solution containing 50 p.p.m. before planting.

Rooted cuttings were more resistant to infection than unrooted. Infection following root and stem inoculation was reduced significantly by applying 50 p.p.m. streptomycin to the sand before rooting and by 10 p.p.m. a few days prior to transplanting, while 50 p.p.m. of an agricultural grade of streptomycin controlled the disease in naturally infected cuttings of a commercial grower. A virulent strain of *E. chrysanthemi* resistant to streptomycin was obtained by growing the bacterium in a substrate containing a small amount of the antibiotic. The culture produced disease in both cuttings and rooted plants treated with streptomycin.

SCHMIDT (TRUDE). **Ein Beitrag zur Löwenmaulrostfrage.** [A contribution to the Snapdragon rust problem.]—*Pflanzenarzt*, 9, 2, pp. 16–18, 1 graph, 1956.

A semi-popular account is given of the life-history of *Puccinia antirrhini* [*R.A.M.*, 15, p. 371], which causes more or less severe annual damage to antirrhinums in Austria [cf. next abstract], followed by a report of experiments on its control by chemical sprays in 1953 and 1954. The best results were obtained with 0·2 per cent. M 555, while two ziram preparations, schorfin (0·75 per cent.) and azira (0·1), were also reasonably effective. All the varieties cultivated at the Plant Protection Station were susceptible, i.e., Red Chief, Rosemarie, Old Gold, Wallflower Fleur, and Queen of the North. Prophylactic measures should include the clearance of stands after flowering and a yearly change of site, while propagation by cuttings should be avoided to obviate the transmission of infection through diseased mother stocks.

LEHOCZKY (J.). **Az oroszlánszáj Rozsdabetegségéről.** [Rust of Antirrhinum.]—*Ann. Acad. Horti- et Viticult., Hung.*, 18 (II), 3, pp. 3–39, 12 figs., 1 diag., 1 graph, 1954. [Russian and German summaries. Received 1956.]

An account is given of antirrhinum rust (*Puccinia antirrhini*) and its occurrence on *Antirrhinum majus* in Hungary [*R.A.M.*, 20, p. 596], where it has been present since 1935.

Starr (M. P.), Volcani (Zafrira), & Munnecke (D. E.). **Relationship of Xanthomonas pelargonii and Xanthomonas geranii.**—*Phytopathology*, 45, 11, pp. 613–617, 1 fig., 1955.

The results of comparative biochemical and cultural determinations and of cross-inoculation tests at the University of California, Davis and Los Angeles, with authentic cultures of *Xanthomonas pelargonii* [*R.A.M.*, 2, p. 371; 35, p. 189] and *X. geranii* [16, p. 612], both agents of a bacterial stem and leaf disease of *Pelargonium hortorum*, demonstrated the identity of the two species [cf. 27, p. 277]. Their combination in *X. pelargonii* is accordingly recommended.

Paton (Mavis R.). **A new disease of Rhododendrons.**—*Gdnrs' Chron. & Gdng ill.* (formerly *Gdnrs' Chron.*, Ser. 3), 139, 10, p. 233, 2 figs., 1956.

Petal blight (*Ovulinia azaleae*) of rhododendron [*R.A.M.*, 34, p. 153], present in Scotland since 1950, is reported to affect particularly June-flowering hybrids and Ghent and Mollis azaleas in many parts of the south-west. Elimination of sclerotia is a possible means of control in the smaller garden where dead trusses are easily removed in the summer. In larger, old-established plantations clearing away the dead leaves and flowers from under the bushes in the winter and covering the area with a suitable mulch two to three inches deep is recommended against the developing sclerotia in the spring.

Gould (C. J.), Eglitis (M.), & Doughty (C. C.), **European Rhododendron rust (Chrysomyxa ledi var. rhododendri) in the United States.**—*Plant Dis. Reptr*, 39, 10, pp. 781–782, 1955. [Multilithed.]

Chrysomyxa ledi var. *rhododendri* [*C. rhododendri*], not previously recorded on *rhododendron* in the United States [cf. *R.A.M.*, 34, p. 516], was collected in 1954 on several varieties of rhododendron in a commercial nursery in western Washington. The rust is believed to have been introduced from Europe on imported plants; infected plants were distributed from the nursery before the disease was identified.

Matthews (Daphne J.). **Glomerella cingulata on Hoya and Azalea in Queensland.**—*Aust. J. Sci.*, 18, 1, pp. 32–33, 1955.

Three types of isolate of *Glomerella cingulata* were obtained from leaf lesions on *Rhododendron indicum*, *Hoya carnosa*, and *H. australis* cultured on 2 per cent. potato dextrose agar at the Department of Botany, University of Queensland, Australia. Two of the isolates, Az 1 and Az 2, came from *R. indicum* and one, H, from the *H.* spp. The aerial mycelium of Az 1 was greyish-white and woolly, the submerged dark; the chlamydospores were thick-walled, the setae dark and septate, and the hyaline (orange-coloured in the mass), uni- or bicellular conidia measured 11·7 to 14·3 by 2·6 to 5·9 μ; the perithecia, produced in irregular, black masses, were 65 to 150 μ in diameter, the asci 35 to 45 by 8 to 11 μ, and the ascospores 10·8 to 20·5 by 2·6 to 5·2 μ. Az 2 resembled the foregoing, but the aerial mycelium was less profuse and the perithecia developed singly or in groups of two or three, many being sterile. The conidia of H measured 7·8 to 16·8 by 2·6 to 5·5 μ (orange-pink in the mass), the perithecia (many sterile) 40 to 150 μ in diameter, the asci 50 to 80 by 8 to 10 μ, and the ascospores 10 to 19 by 2·6 to 5 μ.

The lesions on *H. carnosa* and *H. australis* leaves are white, irregular, often up to 2 cm. across, sunken, the margin clearly defined, with numerous black, subepidermal acervuli. Irregular brown areas extend from the margin for a short distance into the surrounding parts of the leaf and there is a slight yellowing beyond them. On *R. indicum* the lesions, 4 to 10 mm. in diameter, often extend from the leaf margin to the midrib, but seldom across it. The acervuli are dark, setose, and subepidermal. The perfect state has not been observed on any of the hosts. Cross-inoculation tests were performed with the isolates under discussion and a strain of *G. cingulata* causing papery leaf of *Matthiola incana*, with uniformly positive results.

Foster (Virginia). **Fusarium wilt of Cattleyas.**—*Phytopathology*, 45, 11, pp. 599–602, 2 figs., 1955.

Further information is given from the Department of Botany and Plant Pathology, Ohio State University, on *Fusarium orthoceras* var. *longius* [*R.A.M.*, 35, p. 17] (or, according to Snyder and Hansen's classification [25, p. 366], *F. oxysporum* f. *cattleyae*) from *Osmunda* root fibre potting material responsible for a wilt of *Cattleya* orchids.

Withstanding the fungitoxin in the digestion cells of the host [19, p. 232], the fungus penetrates the stele and colonizes the roots, rhizomes, and pseudo-bulbs. The symptoms appearing three to nine weeks after inoculation are particularly severe on the flowers, which are abnormally few, small, and short-lived. The course of the wilt was not noticeably affected by the maintenance of different temperatures, relative humidities, and day-lengths during a 48-hour incubation period.

The culture solutions of 14 monospore isolates increased in alkalinity up to the 100th to 150th day of fungal growth and then declined slightly. Substances which either increased or decreased oxygen absorption in the leaves were produced at different periods of growth in the culture solutions and varied with each isolate. An alcohol-soluble, thermostable fraction of the culture filtrates contained a toxin which caused wilting of Bonny Best tomato plants after periods varying with the individual isolates. An alcohol-insoluble, thermostable fraction induced curling of the edges and browning of the blades of tomato leaflets.

Plakidas (A. G.). **Infectious variegation in Camellias.**—*Camellia Rev.*, 17, 6, pp. 4–6, 1 fig., 1956.

This is a short general article on variegation of virus origin in camellias [*R.A.M.*, 30, p. 108]. The author describes a method of cross-grafting used at Louisiana State University by which the flower colour of the scions of 18 solid-coloured varieties was broken by virus from variegated scions grafted side by side with the healthy on the same stock, *Camellia sasanqua*. Variegation was transmitted from *C. japonica* to *C. sasanqua*, thence to *C. oleifera*, and back again to *C. japonica*, demonstrating that variegation in these species was caused by the same virus.

Infected white varieties show leaf variegation but the flowers are unaffected. Certain coloured varieties, including Woodville Red, do not exhibit breaking when infected, though the leaves are splotched with yellow. Others, including Blood of China, break only occasionally; the foliage in this group is brilliant yellow. In yet another group, including Lallabrook, the flowers of infected plants are prominently variegated, but the foliage is either unchanged or shows only a trace of yellow splotching.

The author contrasts virus variegation with variegation of genetic origin.

Gualaccini (F.). **La Gerbera jamesoni Bolus ospite dell' Alternaria porri (Ell.) Neerg. f. sp. solani (E. & M. pro sp.) c.n.** [*Gerbera jamesoni* Bolus, host of *Alternaria porri* (Ell.) Neerg. f. sp. *solani* (E. & M. pro sp.) n. comb.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 183–198, 3 figs., 1955. [English summary.]

In October, 1954, the author observed a *Gerbera jamesoni* plant growing near Albano, Rome, which showed symptoms of *Alternaria* infection closely resembling those described in 1938 by Elisei [*R.A.M.*, 18, p. 114]. Inoculations of healthy *Gerbera* and potato plants with the fungus isolated from infected leaves gave positive results on both. From its morphological and physiological characters and the results of the inoculation experiments the fungus is identified as *A. porri* f. sp. *solani* [*A. solani*: cf. 31, p. 239].

A. tenuis was also present on the leaves of the original host plant, but in inoculations of healthy *Gerbera* and potato plants it gave negative results.

It is concluded that the identification of the various forms of *A. porri* by inoculation to different hosts is rendered uncertain by the fact that individual forms or their physiological races are able to attack plants of different families.

Drummond-Gonçalves (R.). **'Ferrugem branca' em Ipoméia.** [White rust of *Ipomoea.*]—*Biológico*, **21**, 11, pp. 199–203, 2 figs., 1955.

In April, 1955, a severe attack of white blister (*Albugo* [*Cystopus*] *ipomoeae-panduratae*) [*R.A.M.*, 7, p. 21] occurred on *Ipomoea horsfalliae*, an attractive climbing plant widely cultivated in Piracicaba and Campinas, Brazil. The same species is also fairly common on sweet potato in São Paulo. Other species occurring in the State include *C. candidus* [20, p. 42] on horse-radish [cf. 34, p. 502].

After drastic pruning and the burning of infected material to prevent the development of new infection, diseased *I. horsfalliae* plants should be sprayed two or three times at 20-day intervals with 1 per cent. Bordeaux mixture or some other copper-containing fungicide.

Boosalis (M. G.). **A strain of Xanthomonas translucens var. undulosa that infects Bromus commutatus and Bromus tectorum.**—*Plant Dis. Reptr*, 39, 10, pp. 751–754, 1955. [Multilithed.]

The author records the discovery of *Xanthomonas translucens* var. *undulosa* [*R.A.M.*, 32, p. 239] on the two winter weeds, *Bromus tectorum* and *B. commutatus*, in Nebraska in 1951, a new record for these hosts. Apparently a strain of the pathogen is involved which differs from that on wheat; greenhouse experiments indicated that the brome strain is weakly parasitic on cereals and is of minor importance in the development of *Xanthomonas* streak on the latter in the field.

Theis (T.). **Some diseases of Puerto Rican forage crops.**—*Bull. P.R.* [*fed.*] *agric. Exp. Sta.* 51, 31 pp., 26 figs. 1953.

The 20 most important forage grasses of Puerto Rico are listed in alphabetical order, with the principal fungus diseases found attacking them during a survey made in 1949–51. *Helminthosporium* spp. caused leaf spots of *Axonopus compressus* and *Bouteloua heterostega*; *H. cynodontis* was found on *Cynodon dactylon* [cf. *R.A.M.*, 32, p. 131], *H. ravenelii* on *Sporobolus indicus* and *S. poiretii*, and *H. sacchari* on *Pennisetum purpureum* [cf. 33, p. 102]. Prevalent rusts were *Puccinia cynodontis* on *C. dactylon*, *Uromyces leptodermus* on *Eriochloa polystachya* and *Panicum purpurascens*, *Puccinia levis* on *Paspalum plicatulum*, *Puccinia purpurea* on sorghum [C.M.I. map No. 212], *U. ignobilis* on *Sporobolus indicus*, and *P. polysora* on *Tripsacum laxum*. Among the smuts causing appreciable damage were *Sphacelotheca cruenta* on sorghum and *Ustilago affinis* on *Stenotaphrum secundatum*. Several grasses were affected by ergot, *Claviceps* spp. on *Melinis minutiflora*, *Panicum purpurascens*, *Paspalum conjugatum*, and *P. virgatum*, *C. maximensis* on *Panicum maximum*, and *C. paspali* on *Paspalum plicatulum*. During the winter months severe epiphytotics of black linear leaf spot (*Phyllosticta panici*) occurred on *Panicum maximum*, probably reducing yields. Occasionally *Paspalum virgatum* was partially defoliated by tar spot (*Phyllachora cornispora*).

Among the diseases attacking legumes, powdery mildew (*Oidium* sp.) reduced yields of *Pueraria phaseoloides*, while *Cercospora stizolobii* was of little importance on *Stizolobium deeringianum*. A useful reference list of 44 titles is appended.

Graham (J. H.). **A disease of Orchardgrass caused by Pleospora phaeocomes.**—*Phytopathology*, 45, 11, pp. 633–634, 1 fig., 1955.

A hitherto undescribed disease of *Dactylis glomerata* has been under observation

in Pennsylvania since 1953. In nature the causal organism, *Pleospora phaeocomes*, not previously known to be parasitic, produces near the leaf margins light brown, irregular lesions, up to 15 by 5 mm. On inoculated leaves the lesions are yellow to orange, circular or oblong, 1 to 4 mm. in diameter, and often encircled by a translucent border; as they enlarge and coalesce the centres become necrotic and finally part or all of the leaf dies.

Sporulation is sparse on host tissue. The dark brown, 5- to 8-septate conidiophores, arising singly or very rarely in groups of two or three between the epidermal cells or through the stomata, measure 103 to 232 by 6 to 11 μ and produce four to six pale to greenish-brown, straight, 4- to 6-septate conidia, 42 to 83 by 10 to 17, mostly 50 to 70 by 11 to 15 μ, which normally germinate from the terminal cells. The conidia of *P. phaeocomes* are rather similar to those of the *Helminthosporium gramineum* complex [*R.A.M.*, 30, p. 472]. Mature perithecia on overwintered leaves are black, erumpent, 600 to 850 by 400 to 620 μ, with a short, broad beak; dark brown, septate setae, up to 300 μ long, arise from the upper portion. The pseudoparaphysate, slightly clavate, thick-walled asci measure 200 to 260 by 40 to 50 μ and enclose oblong to ellipsoid, yellow to orange, five-septate ascospores, 41 to 67 by 20 to 26 μ. The optimum temperature for the production of the pale to dark grey mycelium in potato dextrose broth was about 20° C.; above 25° its development was greatly retarded. Monoconidial and ascospore cultures were equally pathogenic to *D. glomerata* in greenhouse inoculations but did not infect any of the other common forage grasses tested. Seedlings of *Holcus lanatus*, which is grown only on a limited scale, sustained minor damage.

E. Müller has reported the occurrence of *P. phaeocomes* on *Calamagrostis varia* in Switzerland [31, p. 354], but this is the first record of its presence in the United States.

Shurtleff (M. C.) & Howard (F. L.). **1953 turf fungicide trials in Rhode Island.**—*Golf Course Reptr*, 22, 4, pp. 5–9, 1954. [Abs. in *Biol. Abstr.*, 29, 5, p. 1231, 1955.]

In studies conducted in Rhode Island in 1953 with 18 turf and lawn grasses and 29 strains of *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, 33, p. 728; 35, p. 192], *Zoysia* and crabgrass [*Digitaria* spp.] were highly resistant. Three sprays at weekly intervals of calocure or calochlor (2 oz. in 10 gals. of water per 1,000 sq. ft.) gave complete control; fungicides containing nitrogen increased infection. Good control of *Helminthosporium vagans* [33, p. 607] on bluegrass [*Poa pratensis*] was given by phenyl mercury acetate, which, however, appeared to increase susceptibility to rust [*Puccinia ? graminis*: cf. 26, p. 493].

Hardison (J. R.). **Crown wart of Lotus uliginosus found in Oregon.**—*Plant Dis. Reptr*, 39, 10, pp. 749–750, 1 fig., 1955. [Multilithed.]

Physoderma potteri, not previously reported on *Lotus uliginosus* in the United States, was first recorded on this host in 1952 in Coos and Tillamook counties along the Oregon coast. The appearance of the disease is threatening the cultivation of *L. uliginosus*, which is becoming a valuable forage legume along the north Pacific coast in wet areas.

Korobeinikova (Mme A. V.). Влияние покровных культур и уплотнения снега на снижение фузариоза Клеверов. [The effect of cover crops and snow density on reduction of *Fusarium* in Clover.]—Докл Акад. сельскохоз. Наук Ленина [*Rep. Lenin Acad. agric. Sci.* = *Proc. Lenin Acad. agric. Sci.*], 21, 1, pp. 20–23, 1956.

At the Ural Branch of the U.S.S.R. Academy of Sciences winter rye, seed-treated with granosan and grown in soil inoculated with a *Fusarium* sp. attacking clover

[cf. *R.A.M.*, 29, p. 622], was more susceptible than spring cereals, succumbing to 90 per cent. infection as against 16·8, 10, and 7 per cent., respectively, for spring wheat, oats, and barley. It is, therefore, regarded as an undesirable cover crop for clover.

In further trials the effect of cover crops on infection of clover by *Fusarium* sp. was studied in naturally and artificially infested soil. In September, following harvest of the winter rye and spring wheat cover crops, infection in the clover was 87·7 and 42 per cent., respectively, the corresponding percentages for hay yield being 100 and 171·2. Clover planted in artificially inoculated soil after spring wheat, barley, or oats had, respectively, 70, 68, and 52 per cent. infection in the autumn as against 26, 20, and 24 per cent. infection, respectively, for clover alone in infested soil. Following intensification of the frostiness of the soil surface by artificially compacting the snow and lowering the temperature the percentage of clover plants killed in 1950 was reduced from 49 (under non-compacted snow) to 30·6 and in 1951 from 14·8 to 5·8. Similarly, yields were increased from 53 to 74·5 and from 100·2 to 133·3 per cent. in the two years, respectively.

Stivers (R. K.), Jackson (W. A.), Ohlrogge (A. J.), & Davis (R. L.). **The relationships of varieties and fertilization to observed symptoms of root rots and wilt of Alfalfa.**—*Agron. J.*, 48, 2, pp. 71–73, 1956.

When three lucerne varieties planted in 1946 in north central Indiana were given a nitrogen-phosphorus-potassium fertilizer (three applications over a three-year period) at 0–28–28, 0–161–161, and 0–528–528, the stand of third-year Buffalo lucerne was poorer (33 per cent. loss) than Ranger (14) or Grimm (5) at the lowest rate but there was one-third to one-half the loss and less difference at the higher rates. In 1949 81 per cent. of the Buffalo plants had rot extending from the crown into the root and it was more severe than in the other two varieties (54·9 and 42·7, respectively). In all three the highest percentage of plants with rot extending to the roots occurred with the lowest fertilizer rate; the highest percentage with crown rot only was at the highest rate. The fungi most commonly isolated from the crowns and roots were *Ascochyta imperfecta* [*R.A.M.*, 32, p. 486; cf. next abstract], *Sclerotinia trifoliorum* [loc. cit.], *Fusarium oxysporum*, *F.* '*roseum*', and *F. solani* [30, p. 374] but inoculation experiments did not establish any pathogenicity. Stands and yields of Grimm (at all rates) were reduced to 17 per cent. and 1,780 lb. per acre, respectively, by 1950–1, compared with 22 and 2,636 for Buffalo and 39 and 2,811 for Ranger, and suffered more bacterial wilt (*Corynebacterium insidiosum*) [34, p. 791], particularly at the lowest rate of fertilization.

Schenk (N. C.). **Taxonomy, pathogenicity and host-parasite relations of Phoma trifolii and Ascochyta imperfecta on Red Clover and Alfalfa.**—*Diss. Abstr.*, 15, 10, pp. 1694–1695, 1955.

A comparative study at the University of Illinois of isolates of *Phoma trifolii* [*R.A.M.*, 34, p. 236] and *Ascochyta imperfecta* [34, p. 438; cf. preceding abstract], the agents of spring black stem disease of red clover and lucerne, respectively, revealed that in both groups pycnidial formation was meristogenous and subepidermal. There was no significant difference between the spore measurements of the two on potato dextrose agar, sterilized red clover and lucerne stems, or on the living host in the greenhouse. Both produced similar types of root rot and damping-off lesions on seedlings of each host, though all isolates were of significantly greater pathogenicity on the host from which they were originally isolated. Both penetrated each host directly and through the stomata and caused girdling only of young stems. On the other hand, the red clover isolates required light for sporulation on potato dextrose agar and varied considerably in culture while the lucerne isolates sporulated under all conditions of light and darkness and were very uniform.

The latter had more uniseptate spores on potato dextrose agar while those from clover had a greater range of spore septation on lucerne stems than the lucerne isolates. Both groups were predominantly non-septate on sterilized red clover stems. Spores of red clover isolates consistently germinated more rapidly than those of the lucerne isolates and the growth rate was more rapid. In view of the distinct differences between the two groups it would appear preferable to retain the present classification.

Hochapfel (H.). **Einiges über Chloridempfindlichkeit und Mangelerscheinungen bei Obstsämlingen im Vegetationsversuch.** [Something about chloride sensitivity and deficiency symptoms in fruit seedlings in a growth experiment.]—Reprinted from *Kali-Briefe*, Fachgebiet 5, 1. Folge, 8 pp., 1956.

Descriptions are given of the symptoms characteristic of physiological disturbances in the metabolism of apple, pear, peach, and strawberry seedlings induced at the Institute for Horticulture, Heidelberg, Germany, by chloride sensitivity and deficiencies of various minerals, of which potassium, magnesium, boron, and iron were the most important.

Padfield (C. A. S.). **Factors affecting incidence of superficial scald in the Rome Beauty Apple and its coloured sport, Frimley Beauty.**—*N.Z. J. Sci. Tech.*, Sect. A, 37, 4, pp. 312–317, 1955.

Studies were carried out from 1951 to 1954 at the Fruit Research Station, Havelock North, New Zealand, on the development of superficial scald on Frimley Beauty and Rome Beauty apples [*R.A.M.*, 30, p. 571; 34, p. 730] in relation to the time of picking, delay between harvest and cool storage [33, p. 91], and the use of oiled paper. The former variety was found to be more susceptible than the latter. Scald developed earlier and varied in intensity in different years and in different orchards with both varieties. Early picking (late March) generally favoured scald development and delay between harvesting and cool storage markedly increased the disorder, particularly with Frimley Beauty. It was usually moderately severe on fruit withheld from storage for seven days and very severe with 14 days' delay. Wrapping the fruit in oiled paper, while not eliminating scald, reduced its incidence by over 50 per cent. irrespective of the periods of delay. Since it is impossible to forecast scald, oiled wraps are recommended for both these varieties grown in the Hawkes Bay area.

Bremer (H.). **Pathologische Beobachtungen an Obstbäumen im Trockenklima.** [Pathological observations on fruit trees in a dry climate.]—*Z. PflKrankh.*, 62, 8–9, pp. 500–514, 6 figs., 1955. [English summary.]

The information in this paper concerning fruit tree diseases in central Anatolia, Turkey, is largely recapitulated from previous studies on the pathological effects of aridity [*R.A.M.*, 26, p. 495; 33, pp. 13, 743, *et passim*].

Hockey (J. F.). **Timing of organic mercury fungicide applications.**—*Commonw. phytopath. News*, 2, 1, pp. 4–5, 1 fig., 1956.

Under the conditions obtaining in Nova Scotia better control of apple scab [*Venturia inaequalis*: *R.A.M.*, 35, p. 158] is achieved with organic mercury fungicides than with lime-sulphur. The most popular fungicide is phenyl mercury acetate; phenyl mercury lactate and fixtan are also used. Applications are made after infection periods, which are identified by the use of the Mills chart [32, p. 666]. The first spray, immediately following the first infection period after the appearance of susceptible new spring growth, is effective for seven days. The second spray is applied not less than a week after the first, and then only if a second infec-

tion period has occurred. Subsequent applications are made at intervals of ten days, or longer in the absence of infection periods. Thus these fungicides appear to eliminate new foci from the preceding infection period and at the same time to provide protection from reinfection, the residual effect lasting several days.

FOTHERGILL (P. G.) & ASHCROFT (ROSALIND). **Further nutritional studies of Venturia inaequalis.**—*J. gen. Microbiol.*, 13, 3, pp. 399–407, 1955.

A further series of nutritional experiments carried out in co-operation between King's College and the Royal Victoria Infirmary, Newcastle upon Tyne, on cultures from single ascospores isolated at Wisconsin University from a single ascus of *Venturia inaequalis* [cf. *R.A.M.*, 35, p. 23] demonstrated that thiamine stimulated the growth of all the cultures far more than any other vitamin. Apple leaf decoctions contained stimulatory amino acids, chiefly isoleucine, glutamine, serine, and phenylalanine. Optimum growth of certain cultures was secured by thiamine and various amino acids, but in general their reaction to the additives varied according to the culture used and the combination of nutrients. The nutritional requirements appeared to reflect the genetic composition of a given culture. In place of leaf decoctions oxoid peptone and asparagine were good nitrogen sources. At least ten amino acids were present in the leaves of some or all of the apple varieties tested. The results suggest that nutrition may be genetically controlled in a way similar to the inheritance of pathogenicity by *V. inaequalis* [21, p. 208; 34, pp. 231, 376].

MOORE (M. H.). **Field methods for testing fungicides for Apple and Pear trees.**—*C.R. (III^e) Congr. int. Phytopharm., Paris, 1952*, 2, pp. 628–633, 2 figs., [? 1953. Received 1955.]

The methods of testing fungicides at East Malling Research Station, described in this paper, have been noticed already from other sources [*R.A.M.*, 33, p. 91].

MCKEEN (W. E.). **Pear blast on Vancouver Island.**—*Phytopathology*, 45, 11, pp. 629–632, 11 figs., 1955.

In the epiphytotic of blossom and twig blight of pear (*Pseudomonas syringae*) on Vancouver Island, British Columbia, during early May, 1953 [*R.A.M.*, 34, p. 793; 35, p. 160], lesions were also produced on the leaves and fruits. The bacterium multiplies so rapidly that its effects in individual orchards may be destructive. Although the disease has been present on the Island for some years (possibly 20), it has been confused with fireblight (*Erwinia amylovora*) and boron deficiency [32, p. 321]. The Bosc variety sustained heavy damage; an Olivier de Serre tree, top-worked with a scion of unknown origin, was resistant to blossom infection.

P. syringae proved very sensitive to streptomycin and aureomycin, making no growth in a broth solution containing 1 p.p.m. or on agar with 50 p.p.m. of the former antibiotic. Infection was also controlled in the greenhouse when seven sprays containing 500 p.p.m. crude streptomycin were applied at weekly intervals. *P. syringae* grows on yeast extract agar at 1° C. and may therefore induce canker formation during the winter.

KASZONYI (S.). **Faiskolai csonthéjasok cilindrosporiumos betegsége.** [*Cylindrosporium* on stone fruits in nursery gardens.]—*Növénytermelés*, 4, 4, pp. 337–350, 10 figs., 1 graph, 1955. [Russian and English summaries.]

Cylindrosporium padi [cf. *R.A.M.*, 33, p. 362], present on cherry grafts in nurseries in Hungary since 1939, has also been observed since 1951 on leaves of plum, *Prunus mahaleb*, almond, and apricot, the last mentioned being a new host in Europe. The disease is confined to the foliage, the purplish lilac leaf spots usually dropping out,

except on sweet and sour cherry, *P. mahaleb*. The perfect state of the fungus has not been found. Spray applications should start when the new leaves appear at the beginning of April and continue to the end of August or the beginning of September. A 0·5 per cent. Bordeaux mixture or lime-sulphur, with 0·5 per cent. ferrous sulphate added in summer, give satisfactory control.

Oyer (E. B.). **The effect of tetrachloroethylene and related compounds on some physiological processes of fungus and higher plant tissues.**—*Diss. Abstr.*, 15, 10, pp. 1708–1709, 1955.

Experiments at Purdue University [Lafayette, Indiana] demonstrated the toxicity of the vapour phase of tetrachloroethylene (TCE) to the conidia and mycelium of *Monilinia* [*Sclerotinia*] *fructicola* [*R.A.M.*, 34, p. 305], the agent of peach brown rot. Using the LD50 value as the index of toxicity the decreasing order of activity of TCE and three related compounds was s-tetrachloroethane, TCE, 1,1,2-trichloroethane, and trichloroethylene [loc. cit.]. Using the thermodynamic activity of the vapour at the LD50 as the toxicity index the order was TCE, trichloroethylene, s-tetrachloroethane, and 1,1,2-trichloroethane. The mycelium was more sensitive to TCE than the spores. Brown rot incidence in artificially inoculated peaches was greatly reduced by fumigation for 18 hours with TCE at about 18 mg. per l., but the fruit was injured by exposure to concentrations exceeding 40 mg., while little control was secured at less than 8 mg. per l. TCE vapour stimulated respiration in pre-climacteric peach and apple fruits and increased the permeability of the cell membranes in red beet root disks. It would appear, therefore, that the toxicity of TCE is due to its effect on membrane permeability.

Wolfe (H. R.). **Relation of leafhopper nymphs to the western X-disease virus.**—*J. econ. Ent.*, 48, 5, pp. 588–590, 1955.

In further tests at the Washington Agricultural Experiment Station [*R.A.M.*, 33, p. 488] peach western X-disease virus [strain of peach X-virus: 35, p. 286] was transmitted from infected seedlings of chokecherry [*Prunus virginiana* var. *demissa*], Lovell peach, and Royal apricot to Lovell peach seedlings by third- to fifth-instar nymphs of *Fieberiella florii* and *Colladonus geminatus* [33, p. 735]. Experimental transmissions were also obtained with adults of *C. geminatus*, *F. florii*, and *Scaphytopius acutus* that had acquired the virus as nymphs. It appears that all five instars of *C. geminatus* can acquire the virus, whereas in *S. acutus* the ability to do so is evidently limited to the fifth instar.

Gilmer (R. M.). **Imported Mahaleb seeds as carriers of necrotic ring spot virus.**—*Plant Dis. Reptr*, 39, 10, pp. 727–728, 1955. [Multilithed.]

When seedlings of Mahaleb cherry [*Prunus mahaleb*: *R.A.M.*, 35, p. 377] raised from seed imported from Europe were indexed on cucumber at New York State Agricultural Experiment Station, Geneva, symptoms indistinguishable from those of cherry necrotic ring spot virus were produced. It appears, therefore, that the virus may be imported in such seed [cf. 28, p. 339].

Turner (W. F.) & Pollard (H. N.). **Additional leafhopper vectors of phony Peach.**—*J. econ. Ent.*, 48, 6, pp. 771–772, 1955.

At the Entomology Research Branch, United States Department of Agriculture, two additional species of Tettigellinae were recently shown to act as vectors of phony peach virus [*R.A.M.*, 28, p. 224], viz., *Draeculacephala* sp. and *Homolodisca insolita*, of which the latter was much the more efficient in transmission experiments to peach and plum.

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Vol. XXXV, page 359, line 16: for 'Turrialba, Costa Rica' read 'Quevedo, Ecuador'.